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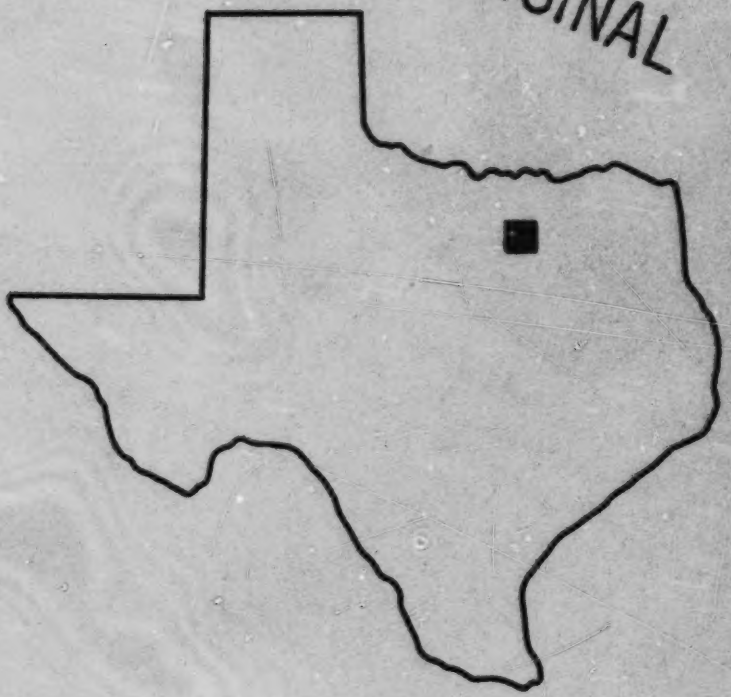
JAN 27 1986

FLOOD INSURANCE STUDY

COMPLETED 1987

ORIGINAL

CITY OF GARLAND, TEXAS
DALLAS COUNTY



APRIL 30, 1986

Federal Emergency Management Agency

COMMUNITY NUMBER - 485471

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NOTICE TO
FLOOD INSURANCE STUDY USERS

This Flood Insurance Study was revised on April 30, 1986. Users should refer to the Revision Description section (Section 9.0) of this text for further information.

Part or all of this Flood Insurance Study may be revised at any time. The user is therefore cautioned that a published map revision (i.e., a revised Flood Insurance Rate Map) may not include a reprinting of the text, tables, and/or profiles, resulting in a discrepancy between the revised map and the original study components. It is the responsibility of the user to consult with community officials to obtain the most current Flood Insurance Study components.

Initial Flood Insurance Study Effective Date: April 16, 1971

Flood Insurance Study Revised: July 1, 1974
October 3, 1975
November 1, 1979
March 15, 1984
April 30, 1986

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TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
	1.1 Purpose of Study	1
	1.2 Authority and Acknowledgements	1
	1.3 Coordination	1
2.0	AREA STUDIED	2
	2.1 Scope of Study	2
	2.2 Community Description	4
	2.3 Principal Flood Problems	4
	2.4 Flood Protection Measures	5
3.0	ENGINEERING METHODS	5
	3.1 Hydrologic Analyses	5
	3.2 Hydraulic Analyses	15
4.0	FLOOD PLAIN MANAGEMENT APPLICATIONS	17
	4.1 Flood Boundaries	17
	4.2 Floodways	18
5.0	INSURANCE APPLICATION	31
	5.1 Reach Determinations	32
	5.2 Flood Hazard Factors	32
	5.3 Flood Insurance Zones	32
	5.4 Flood Insurance Rate Map Description	33

BEST COPY AVAILABLE

TABLE OF CONTENTS - continued

		Page
6.0	OTHER STUDIES	33
7.0	LOCATION OF DATA	39
8.0	BIBLIOGRAPHY AND REFERENCES	39
9.0	REVISION DESCRIPTION	41
	9.1 Purpose	41
	9.2 Acknowledgments	41
	9.3 Scope	41
	9.4 Revisions Bibliography	41

FIGURES

Figure 1 - Vicinity Map 3

Figure 2 - Damage cuased by the flood of June 15, 1949, to a supermarket in the Duck Creek Shopping Center 6

Figure 3 - Duck Creek during the flood of April 30, 1966 7

Figure 4 - Future flood heights on Duck Creek at Centerville Road 8

Figure 5 - Future flood heights on Duck Creek at Garland Avenue 9

Figure 6 - Future flood heights on Bradfield Creek at Castle Drive 10

Figure 7 - Future flood heights on Spring Creek at North Star Road 11

Figure 8 - Floodway Schematic 31

BEST COPY AVAILABLE

TABLE OF CONTENTS - continued

Page

TABLES

Table 1 - Summary of Discharges 12 - 15

Table 2 - Floodway Data 19 - 30

Table 3 - Flood Insurance Zone Data 34 - 38

EXHIBITS

Exhibit 1 - Flood Profiles

Duck Creek	Panels 01P - 06P
Stream 2C1	Panels 07P - 08P
Long Branch	Panels 09P - 11P
Stream 2C2	Panel 12P
Stream 2C3	Panels 13P - 15P
Stream 2C4	Panel 16P
Stream 2C5	Panels 17P - 18P
Stream 2C6	Panel 19P
Rowlett Creek	Panels 20P - 22P
Stream 2D1	Panel 23P
Mills Branch	Panels 24P - 26P
Stream 2D3	Panel 27P
Bradfield Creek	Panels 28P - 30P
Stream 2D13	Panel 31P
Stream 2D14	Panels 32P - 34P
Stream 2D4	Panels 35P - 37P
Stream 2D5	Panels 38P - 40P
Stream 2D6	Panel 41P
Spring Creek	Panels 42P - 44P
Stream 2I1	Panels 45P - 46P
Stream 2I2	Panels 47P - 48P
Stream 2I3	Panels 49P - 51P
Stream 2I4	Panels 52P - 53P
Stream 2I5	Panels 54P - 56P
Stream 2I6	Panels 57P - 58P
Stream 2I7	Panel 59P

Exhibit 2 - Flood Boundary and Floodway Map Index
Flood Boundary and Floodway Map

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PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

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FLOOD INSURANCE STUDY
CITY OF GARLAND, TEXAS

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to restudy the severity of flood hazards in the City of Garland, Dallas County, Texas, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of the information will be to convert the City of Garland to the regular program of flood insurance by the Federal Emergency Management Agency (FEMA). Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

1.2 Coordination

Community base map selection and the identification of streams requiring detailed study were determined during the initial coordination meeting held on July 15, 1976, attended by the Community Executive Officer (CEO), the Community Coordination Officer (CCO), a Texas Water Development Board (TWDB) representative, and a U.S. Army Corps of Engineers (COE) representative. The Soil Conservation Service (SCS), the State Department of Highways and Public Transportation, and the TWDB were contacted for information related to the study. A final coordination meeting was held on September 15, 1978, in Garland, at which time the results of this study were reviewed with community officials. In addition to the COE and FEMA officials, the TWDB was represented at this meeting.

The hydrologic and hydraulic data used in this study were coordinated with data developed for and contained in the previous Flood Insurance Study of Garland.

1.3 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by U.S. Army Corps of Engineers, Fort Worth District, for the Federal Insurance Administration under Interagency Agreement Nos. IAA-H-7-76, Project Order No. 21 and IAA-H-19-77, Project Order No. 2. This work, which was completed in August 1977, covered all significant flooding sources in the City of Garland.

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2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the City of Garland with the exception of a power line right-of-way extending to a city-owned power plant. This power line right-of-way is 100 feet wide and extends through a part of Rockwall County and into Collin County. This right-of-way is owned by the city, and development is not expected to take place on this right-of-way.

The area of study is shown on the Vicinity Map (Figure 1). Detailed Hydrologic and hydraulic studies were made on 26 streams affecting the City of Garland. These streams are listed in Section 5.1 of this report. It was agreed between the COE, the FEMA CCO, and the city that the detailed studies shown in this report cover the flood hazard areas needing analysis and that all other areas would be shown as approximate where USGS Flood Prone Area Maps (Reference 1) are available.

All areas studied in detail were chosen with consideration given to all forecasted development until August 1982.

This study was prepared as part of a larger study entitled "Dallas County Metro Area, Texas", covering all of Dallas County and portions of Collin, Denton, Rockwall, and Tarrant Counties. In order to facilitate the management, filing, and retrieval of the large amount of data produced during the study and to insure compatibility of data provided to adjoining communities, and to simplify future changes due to changes in city boundaries, the following plan of study was developed.

The USGS 7.5 minute quadrangle maps covering the entire area to be studied were enlarged to a scale of 1 inch equals 1,000 feet. These maps were divided into quarters and used to prepare master work maps for the entire metro area study. As the engineering data developed on a stream or watershed basis were completed, they were transferred to the appropriate work map. Floodway data and flood insurance zone data tables were also prepared as the engineering on each stream was completed. When the master work maps contained all the data necessary for the completion of the Garland Flood Insurance Study, copies were made and used to prepare the work maps for this report. The flood profiles were prepared in a similar manner. Data were extracted from the previously mentioned floodway data and flood insurance zone data tables to prepare similar tables for this report. Since the tables contained in this report relate only to the City of Garland, the first letter designation for a cross section for any particular stream may or may not begin with the letter A.

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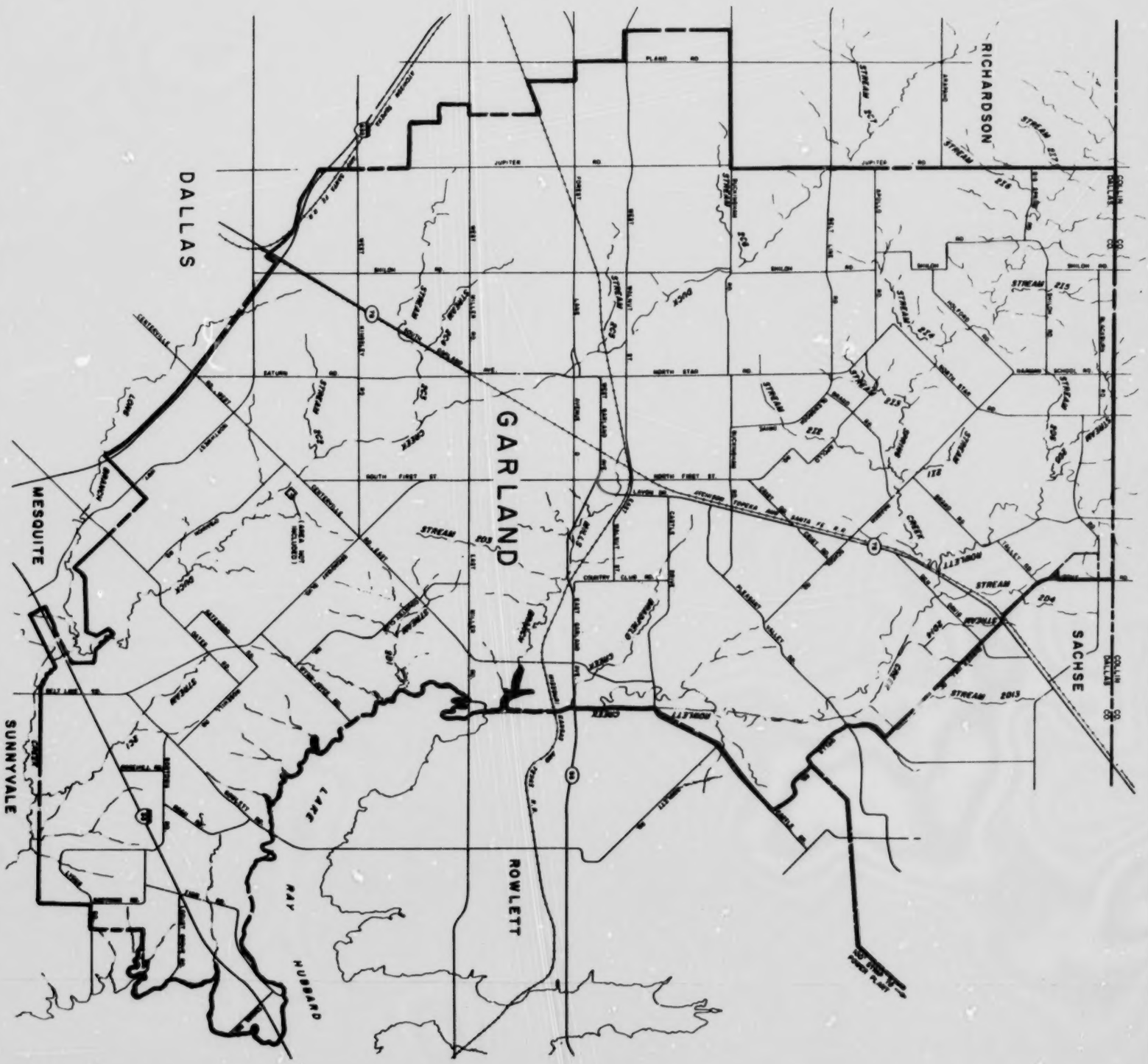

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX

(DALLAS CO.)

APPROXIMATE SCALE

0 6000 12000 18000 24000 FEET

VICINITY MAP

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2.2 Community Description

Garland is located in north central Texas in the northeast part of Dallas County. The Texas Municipal League estimated the 1975 population of Garland as 126,189, an increase of 44,752 over the 1970 census. This represents an increase of 55 percent in 5 years.

Prior to World War II, Garland's economic development centered around agricultural products and ranching. Since that time the city has experienced rapid industrial development, particularly in the field of electronics. Garland now has a total of over 250 industries. The city is bounded on the south by the cities of Mesquite and Sunnyvale, on the west by Dallas and Richardson, on the north by Richardson, and on the east by Sachse, Rowlett, and Dallas.

The northeast part of the city is drained by Rowlett Creek and its tributaries and the southwest portion by Duck Creek and its tributaries. Figure 1, the Vicinity Map, shows the location of Garland with respect to the streams which drain it. The Garland area has terrain characteristic of the Blackland Prairie. The topography is gently rolling to almost level with narrow streams being well incised. The soils in the area are mainly of the Houston Black, Heiden, and Austin series. The native vegetation consists of bunch and short grasses with scattered mesquite trees on the uplands; and hardwoods, mainly elm, hackberry, and pecan, occurring along the streams.

Most of the existing development in Garland lies in the central portion of the city. Rapid residential development is taking place in the upper and lower Duck Creek watershed and in the Spring Creek watershed. Most of the existing industrial development lies in west central Garland.

The climate of the study area is warm, temperate, and humid. Summers are hot, and winters are short and mild. Extremes of temperature and precipitation are of relatively short duration. The annual mean precipitation is about 35 inches. The mean relative humidity is 63 percent, and average temperature is 65.8 degrees F. The record temperature extremes range from a maximum of 111 degrees F in July 1954 to a minimum of -3 degrees F in January 1930.

2.3 Principal Flood Problems

The principal flood problem area in the City of Garland is the low-lying area adjacent to Duck Creek. Damaging floods occurred on Duck Creek in June 1949, May 1957, July 1962, and April 1966. These floods caused considerable damage and the loss of at least four lives. The report on monetary damages for floods of record on Duck Creek is as follows: $440,000 in 1949; $130,000 in 1957; $500,000 in 1966; and $571,000 for the entire city of Garland, in July 1962 (all damages are given in dollars of the year of the flood). The June 1949 flood is estimated to have had a recurrence interval of about once in 50 years based on existing conditions.

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The City of Garland has experienced few flood problems in the Rowlett Creek watershed. This is due to the fact that the area was undeveloped until very recently and the city is exercising more stringent land use controls. Large floods are known to have occurred on Rowlett Creek, the largest being the April 1942 flood which is estimated to have produced a discharge of about 60,000 cfs and to have had a recurrence interval of about once in 100 years. Drift observed in 1967 lodged on the Atchison, Topeka, and Santa Fe railroad bridge located 150 feet upstream from the gage indicates that a discharge of approximately 50,000 cfs occurred, probably in April 1966 or September 1964. The estimated recurrence interval for this flood would be about 50 years. Figure 2 shows damage caused by the June 13, 1949 flood and Figure 3 shows Duck Creek during the flood of April 30, 1966. Figures 4 through 7 show the heights that would be reached by the respective floods on facilities existing within the flood plains considered in this study.

2.4 Flood Protection Measures

Structural flood protection measures in the City of Garland have been limited to short reaches of streams that were enlarged and/or straightened in connection with individual subdivision development and road construction.

The City of Garland regulates flood plain development through an ordinance which prohibits the issuance of building permits or certificates of occupancy in the flood plain districts until the provisions of the ordinance are complied with.

A Federal channel improvement project has been authorized for Duck Creek. However, it now appears that there is no reasonable prospect that the required local cooperation will be forthcoming. Therefore, this project was not considered in this study.

3.0 ENGINEERING METHODS

For flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Floods having recurrence intervals of 10-, 50-, 100-, and 500-years have been selected as having special significance for flood plain management and for flood insurance premium rates. The analyses reported here reflect current conditions in the drainage areas of the streams.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

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FIGURE 2: Damage caused by the flood of June 15, 1949, to a supermarket in the Duck Creek Shopping Center. The water was almost four feet deep in the store.

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FIGURE 3: Duck Creek during the flood of April 30, 1966.

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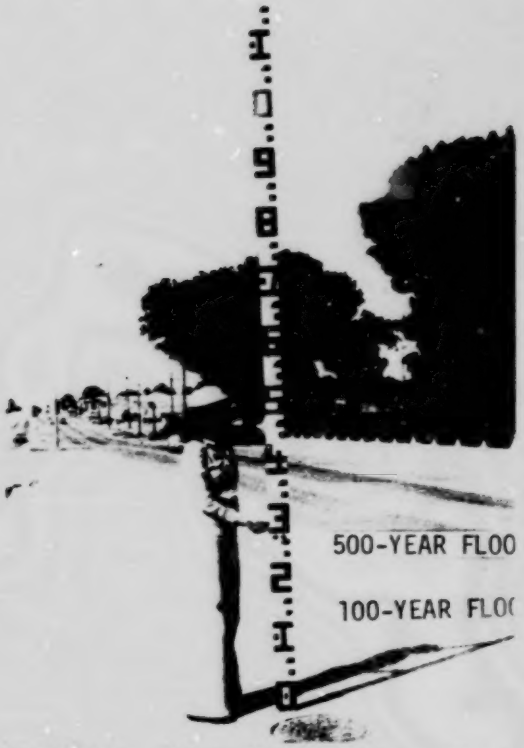

FIGURE 4: Future flood heights on Duck Creek at Centerville Road.

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FIGURE 5: **Future flood heights on Duck Creek at Garland Avenue.**

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FIGURE 6: Future flood heights on Bradfield Creek at Castle Drive.

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FIGURE 7: Future flood heights on Spring Creek at North Star Road.

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The Duck Creek and Rowlett Creek basins were divided into subareas, and synthetic unit and flood hydrographs were developed at selected locations. For Rowlett Creek, flood hydrographs were routed from one discharge location to the next by the PULS routing method (Reference 2). Additionally, numerous headwater areas of less than 2 square miles were modeled using the rational method, where Q = CIA. The variables in this method are defined as follows: Q is the peak discharge in cfs, C is a runoff coefficient, I is the rainfall intensity in inches per hour for the watershed time of concentration, and A is the drainage area in acres.

The USGS established a recording stream gage on Duck Creek at the lower crossing of Beltline Road in January 1958. Historical flood information at this location begins about 1895. Additionally, 21 crest-stage gages were installed in the area above the stream gage in December 1968. In 1968, the USGS established a recording stream gage on Rowlett Creek at Highway 78 in Garland. Historical flood information begins with the flood of 1942.

Historical discharge-frequency curves were developed at the gages. Discharges computed at the gages for existing urbanization with the synthetic hydrograph and PULS routing procedures agree reasonably with those of the historic discharge frequency curves. Historic flood reproductions on Rowlett Creek and Duck Creek, as well as adjacent streams, were used as the bases for the adoption of Snyder's Cp 640 unit hydrograph coefficients. National Weather Service Technical Paper Number 40 (Reference 3) was used in developing the 10-, 50-, and 100-year storms. The 500-year storm was based on extrapolated data. Frequency peak discharges at selected locations were computed. Drainage area-peak discharge relationships for streams in the study area are shown in Table 1, "Summary of Discharges." The decrease in peak discharge with an increase in drainage area for some streams is due to watershed shape and/or overbank storage effects.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
DUCK CREEK					
At Beltline Road Bridge, Station 37,480	31.60	20,500	29,100	32,900	42,400
At Gulf Coast and Santa Fe R.R. Bridge	13.95	13,600	18,900	21,200	26,900
At Jupiter Road Bridge at the corporate limits with the City of Richardson	5.30	9,200	12,500	14,000	17,600

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TABLE 1 - SUMMARY OF DISCHARGES - continued

STREAM 2C1					
At confluence with Duck Creek	1.66	2,550	3,450	3,850	4,850
At Interstate Highway 30 and Highway 67 Bridge	1.09	2,050	2,800	3,150	3,900
LONG BRANCH					
At confluence with Duck Creek	6.70	6,900	9,600	10,800	13,600
At Highway 635 Bridge, 500 feet downstream	3.75	5,400	7,400	8,300	10,500
At Highway 635 Bridge, approximately 340 feet upstream of the corporate limits with the City of Dallas	0.79	2,100	2,800	3,050	3,750
STREAM 2C2					
Confluence with Duck Creek	0.79	2,050	2,700	2,950	3,650
STREAM 2C3					
Confluence with Duck Creek	4.35	6,700	9,100	10,200	12,800
At Shiloh Road Bridge	1.90	3,550	4,850	5,400	6,800
STREAM 2C4					
At Gulf Coast and Santa Fe R.R. Bridge	1.33	2,500	2,400	3,800	4,800
STREAM 2C5					
Confluence with Duck Creek	2.37	4,400	6,000	6,700	8,400
STREAM 2C6					
At confluence with Duck Creek	1.46	2,750	3,750	4,200	5,200
ROWLETT CREEK					
At corporate limits with City of Rowlett	128.43	29,800	51,300	60,200	81,000
At confluence of Spring Creek	120.41	30,900	52,300	61,100	82,200
STREAM 2D1					
Confluence with Rowlett Creek	1.61	2,900	3,850	4,250	5,200
At Centerville Road Bridge	0.32	900	1,150	1,300	1,600

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TABLE 1 - SUMMARY OF DISCHARGES - continued

MILLS BRANCH					
At confluence with Rowlett Creek	4.72	6,500	10,300	12,000	16,200
At Centerville Road Bridge	4.10	7,100	10,000	11,300	14,700
STREAM 2D3					
At confluence with Mills Branch Creek	0.70	2,000	2,650	2,900	3,550
BRADFIELD CREEK					
At confluence with Rowlett Creek	2.02	3,800	5,300	6,000	7,600
STREAM 2D13					
At confluence with Rowlett Creek	0.98	1,650	2,150	2,400	2,950
STREAM 2D14					
At confluence with Rowlett Creek	0.65	1,150	1,500	1,650	2,050
STREAM 2D4					
At confluence with Rowlett Creek	0.74	1,300	1,700	1,900	2,300
STREAM 2D5					
At confluence with Rowlett Creek	1.57	2,450	3,250	3,600	4,400
STREAM 2D6					
At confluence with Stream 2D5	0.53	1,250	1,650	1,800	2,250
SPRING CREEK					
At confluence with Rowlett Creek	36.84	15,100	22,200	25,200	32,000
At confluence of Stream 2I6	27.41	16,500	24,000	27,300	33,700
STREAM 2I1					
At confluence with Spring Creek	0.50	900	1,200	1,300	1,600

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TABLE 1 - SUMMARY OF DISCHARGES - continued

STREAM 2I2					
At confluence with Spring Creek	1.12	3,050	2,700	3,050	3,750
STREAM 2I3					
At confluence with Spring Creek	1.07	2,250	3,000	3,350	4,100
STREAM 2I4					
At confluence with Spring Creek	1.14	2,250	3,000	3,300	4,050
STREAM 2I5					
Confluence with Spring Creek	0.41	750	1,000	1,500	1,400
STREAM 2I6					
Confluence with Spring Creek	0.54	1,350	1,750	1,950	2,400
STREAM 2I7					
Confluence with Spring Creek	0.41	1,000	1,300	1,450	1,750

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the streams in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each stream studied in detail.

Water-surface elevations of floods of the selected recurrence intervals were computed through use of the COE HEC-2 step-backwater computer program (Reference 4). Cross sections for the backwater analyses of the streams studied were field surveyed and were located at close intervals above or below bridges and culverts in order to compute the significant backwater effects of these structures.

Channel roughness factors (Manning's "n") for these computations were assigned on the basis of field inspections of flood plain areas and on previous studies by the COE. Following is a list of "n" value ranges:

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Stream Name	Channel	Overbank
Duck Creek	.070-.040	.100-.070
Stream 2C1	.070-.045	.100-.070
Long Branch	.055-.040	.120-.060
Stream 2C2	.060-.060	.100-.100
Stream 2C3	.070-.050	.120-.060
Stream 2C4	.060-.050	.090-.060
Stream 2C5	.055-.040	.120-.070
Stream 2C6	.060-.030	.075-.030
Rowlett Creek	.060-.030	.095-.040
Stream 2D1	.065-.050	.075-.060
Mills Branch	.055-.035	.085-.075
Stream 2D3	.045-.035	.060-.050
Bradfield Creek	.055-.040	.085-.060
Stream 2D13	.070-.055	.090-.070
Stream 2D14	.060-.060	.100-.100
Stream 2D4	.045-.045	.065-.065
Stream 2D5	.050-.050	.085-.085
Stream 2D6	.040-.040	.080-.080
Spring Creek	.055-.040	.090-.050
Stream 2I1	.040-.040	.060-.060
Stream 2I2	.035-.035	.060-.060
Stream 2I3	.035-.035	.050-.050
Stream 2I4	.040-.040	.060-.060
Stream 2I5	.040-.040	.080-.080
Stream 2I6	.040-.040	.080-.080
Stream 2I7	.050-.050	.080-.080

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.1 foot for floods of the selected recurrence intervals. The computer backwater models for the major streams were compared to previous studies for verification of results. Starting water-surface elevations for Rowlett Creek, Spring Creek, Stream 2C3, and Long Branch were based on coincident conditions. Bradfield Creek was started by the critical depth methods, while the remainder of the streams were based on slope-area method. Normal pool elevation for Lake Ray Hubbard is 435.5 feet National Geodetic Vertical Datum of 1929 (NGVD). The spillway is 560 feet long with a crest elevation of 409.5 feet and has 14 tainter gates (40' x 28' each). These gates have enough capacity to theoretically control the water-surface elevation for a flood as large as the 500-year event to a water-surface elevation at the dam of 435.5 feet NGVD. Subsequent to closure of the dam in 1967, the normal pool elevation of 435.5 feet NGVD has been exceeded three times. The dates and maximum elevations are, respectively, June 1973, 436.00 feet NGVD; July 1973, 435.64 feet NGVD; and March 1977, 435.65 feet NGVD (preliminary). Since the pool elevation of Lake Ray Hubbard is dependent on the operation of the lake, no definitive 100-year or 500-year water-surface elevations can be determined. An elevation of 437 feet NGVD has been adopted as a reasonable elevation for both the 100-year and 500-year floods for Lake Ray Hubbard.

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All elevations are measured from NGVD. Elevation reference marks used in the study are shown and described on the maps. For study purposes it was assumed that no clogging would occur and that all bridge structures would stand intact. Significant changes in this premise imposed by differing conditions of a future flood could alter the estimated flood elevations and flood limits shown on profiles and maps. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles. For stream segments for which a floodway is computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

A prime purpose of the National Flood Insurance Program is to encourage state and local governments to adopt sound flood plain management programs. Each Flood Insurance Study, therefore, includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by Federal Emergency Management Agency (FEMA) as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community.

For each stream studied in detail, the boundaries of the 100-year and the 500-year flood have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using available topographic maps with contour intervals of 10 feet and 2 feet (References 5 and 6) and subdivision grading plans (References 7 and 12). In cases where the 100-year and 500-year boundaries are close together, only the 100-year boundary has been shown. Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

For streams studied by approximate methods, the boundary of the 100-year flood was taken from USGS Flood Prone Area Maps (Reference 1). To assist users of the flood insurance report data in locating the actual boundaries of the base flood or for determining the elevation of specific sites or structures in relation to the base flood, elevation reference marks are shown on the maps. These reference marks include existing U.S. Coast and Geodetic Survey bench marks, as well as bench marks established for the current study.

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4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of FEMA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2). As shown on the Flood Boundary and Floodway Map, the floodway boundaries were determined at cross sections; between cross sections the boundaries were interpolated.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 8.

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Duck Creek							
A	30,700	1547/940[2]	13,102	2.57	443.1	442.1	1.0
B	31,380	1194/260[2]	10,135	3.33	444.3	443.3	1.0
C	37,080	1128/20[2]	10,096	3.34	453.1	452.2	0.9
D	39,080	839/30[2]	7,759	4.24	457.2	456.3	0.9
E	43,970	1030/250[2]	10,087	2.57	464.2	463.4	0.8
F	48,430	790	5,890	4.40	468.6	467.7	0.9
G	53,000	846	7,803	3.58	477.3	476.3	1.0
H	55,100	871	8,089	3.45	481.0	480.0	1.0
I	57,750	632	6,233	4.77	485.4	484.4	1.0
J	61,060	959	2,556	3.47	492.3	491.3	1.0
K	62,420	767	7,459	3.98	495.3	494.3	1.0
L	63,080	686	6,779	4.38	496.4	495.4	1.0
M	64,910	518	5,054	5.88	500.3	499.3	1.0
N	66,180	502	5,474	5.42	506.8	505.8	1.0
O	67,240	517	5,845	4.94	509.1	508.3	0.8
P	68,280	518	5,635	5.13	511.3	510.4	0.9
Q	69,430	511	5,514	5.24	513.9	513.1	0.8

[1]Stream distance in feet above confluence.
[2]Total width/width within Garland corporate limits.

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TABLE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

FLOODWAY DATA

DUCK CREEK

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Duck Creek (continued)							
R	71,470	400	3,301	6.67	516.6	515.8	0.8
S	72,760	545	4,354	5.05	521.3	520.9	0.4
T	75,910	310	2,692	7.88	527.9	527.6	0.3
U	77,750	503	4,036	5.25	536.1	535.2	0.9
V	78,970	700	4,549	4.99	538.7	537.9	0.8
W	81,020	647	4,103	4.26	546.2	546.0	0.2
X	85,820	437	3,335	5.04	562.0	561.6	0.4
Y	87,600	354	3,168	5.30	566.2	565.7	0.5
Z	88,720	452	3,347	5.02	569.2	568.8	0.4
AA	90,700	412	2,672	6.29	574.8	574.3	0.5
AB	93,200	566	4,849	3.69	582.7	581.8	0.9
AC	94,450	444	2,787	6.03	586.7	586.1	0.6
AD	96,800	635	3,891	3.60	591.5	590.8	0.7

[1]Stream distance in feet above confluence.

TABLE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

FLOODWAY DATA

DUCK CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Stream 2C1								
A	3,000	249	1,475	2.61	447.4	447.4	448.2	0.8
B	4,500	150	769	5.01	452.2	452.2	453.2	1.0
C	6,370	180	1,395	2.26	463.6	463.6	464.2	0.6
D	6,720	175	1,274	2.47	463.7	463.7	464.3	0.6
E	7,180	175	874	3.60	463.8	463.8	464.7	0.9
F	7,500	190	944	3.34	464.6	464.6	465.5	0.9
G	7,740	175	640	4.92	466.5	466.5	466.9	0.4
H	8,740	160	651	3.38	472.1	472.1	472.7	0.6
I	10,610	79	354	6.21	481.9	481.9	482.1	0.2
J	12,480	87	295	5.53	493.3	493.3	493.8	0.5
Long Branch								
A	27,050	190	831	3.67	559.3	559.3	560.0	0.7
B	27,330	170	1,051	2.90	560.0	560.0	560.9	0.9
Stream 2C2								
A	1,050	70	474	6.22	500.2	500.2	500.9	0.7
B	1,400	75	362	8.14	504.1	504.1	504.7	0.6
C	1,815	70	593	4.97	509.0	509.0	509.6	0.6
D	3,570	44	331	6.67	530.7	530.7	531.0	0.3
E	4,825	137	644	2.25	545.9	545.9	546.4	0.5

[1]Stream distance in feet above confluence.

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

FLOODWAY DATA

STREAM 2C1 - LONG BRANCH - STREAM 2C2

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Stream 2C3							
A	870	135	1,652	6.18	514.7	513.7[2]	1.0
B	2,600	77	884	11.54	520.0	520.0	0.0
C	4,120	130	1,064	5.83	529.0	528.5	0.5
D	5,550	76	588	10.54	533.6	533.1	0.5
E	5,870	98	852	7.28	538.7	538.7	0.0
F	7,400	139	878	7.06	547.1	547.1	0.0
G	8,540	220	1,035	5.99	553.7	552.8	0.9
H	9,670	74	719	7.51	559.8	559.3	0.5
I	10,200	228	827	6.53	565.7	565.5	0.2
J	11,080	146	829	6.52	571.4	570.5	0.9
K	12,250	209	1,507	2.35	578.6	577.8	0.8
L	12,750	250	1,112	3.19	579.2	578.2	1.0
M	14,140	137	769	3.41	583.4	582.4	1.0
N	15,850	25	160	10.63	588.5	587.6	0.9
Stream 2C4							
A	600	65	401	9.47	530.2	530.2	0.0
B	900	120	927	4.10	541.7	541.1	0.6
C	1,500	120	1,046	3.63	545.2	544.3	0.9

[1]Stream distance in feet above confluence.
[2]Water-surface elevation determined without considering backwater effects from Duck Creek.

TABLE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND,
(DALLAS CO.)

FLOODWAY DATA

STREAM 2C3-STREAM 2C4

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	Distance[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Stream 2C4 (continued)							
D	2,770	106	481	7.90	551.7	551.7	0.0
E	4,680	120	622	4.83	565.8	565.1	0.7
F	5,430	240	886	3.36	571.7	570.9	0.8
G	6.300	150	483	4.55	576.3	575.4	0.9
Stream 2C5							
A	2,650	114	1,024	6.55	551.3	550.3	1.0
B	4,705	102	812	8.25	572.8	572.1	0.7
C	6,975	102	556	8.10	590.2	590.0	0.2
D	8,605	89	661	6.80	600.2	599.4	0.8
E	10,065	157	526	5.22	607.9	607.0	0.9
F	10,770	88	478	5.76	610.9	610.2	0.7
Stream 2C6							
A	870	65	560	7.51	573.0	572.0[2]	1.0
B	1,220	80	441	9.53	574.3	573.5	0.8
C	1,940	130	711	5.91	579.6	579.6	0.0
D	2,900	68	480	8.75	585.7	585.7	0.0
E	3,500	102	520	8.07	589.3	588.5	0.8
F	4,410	212	938	4.48	595.1	594.2	0.9
G	4,820	291	552	7.61	597.0	597.0	0.0
H	5,160	343	1,605	2.62	601.2	600.2	1.0
I	5,480	278	1,203	3.49	602.2	601.3	0.9
J	6,180	119	518	6.56	605.0	604.5	0.5

[1]Stream Distance in Feet Above Confluence. [2]Water-surface Elevation Determined Without Considering Backwater Effects From Duck Creek.

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

FLOODWAY DATA

STREAM 2C4-STREAM 2C5-STREAM 2C6

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	Distance[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Rowlett Creek							
A	42,620	1817/570[2]	20,102	2.97	445.4	444.4	1.0
B	44,050	1649/920[2]	15,729	3.80	445.7	444.7	1.0
C	46,960	1990/1387[2]	23,505	2.54	451.7	450.8	0.9
D	50,150	2574/762[2]	25,009	2.40	453.8	452.9	0.9
E	52,050	1757/917[2]	16,352	3.68	455.0	454.0	1.0
F	55,120	1,601	14,592	4.13	458.0	457.1	0.9
G	58,950	1,748	13,691	4.40	463.3	462.3	1.0
H	61,730	1,672	13,234	4.55	466.6	465.7	0.9
I	65,260	1,943	17,178	3.53	471.6	470.6	1.0
J	67,710	1,647	14,530	4.18	474.6	473.6	1.0
K	70,430	1,412	13,173	4.64	479.8	478.8	1.0
L	75,890	1,017	14,019	2.91	488.9	488.2	0.7
M	78,970	1,343	16,344	2.50	490.2	489.4	0.8
N	84,920	1,836	16,503	2.47	493.5	492.6	0.9
Stream 2D1 Garland, Texas							
A	5,330	210	877	4.4	452.4	451.4	1.0
B	5,560	180	830	4.7	453.7	453.2	0.5
C	5,810	215	1,162	3.4	455.0	454.4	0.6
D	6.040	140	691	5.6	455.7	455.1	0.6
E	6,270	230	991	3.9	457.5	456.7	0.8
F	6,580	245	1,018	3.8	459.1	458.4	0.7
G	6,910	184	727	5.4	461.2	460.4	0.8
H	7,140	225	757	4.0	463.1	462.6	0.5
I	7,460	250	659	4.6	465.1	464.5	0.6
J	7,690	146	416	7.3	467.6	466.8	0.8

[1]Stream distance in feet above confluence. [2]Total width/width within Garland corporate limits.

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

FLOODWAY DATA

ROWLETT CREEK-STREAM 2D1

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	Distance[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Stream 2D1 Garland, Texas (continued)							
K	7,950	100	507	2.6	470.0	469.0	0.0
L	8,150	61	252	5.1	470.2	469.3	0.9
M	8,350	37	131	9.9	471.6	471.6	0.0
N	8,530	100	807	1.6	482.1	481.4	0.7
Mills Branch							
A	1,700	237/110[2]	1,904	6.30	446.6	445.8	0.8
B	2,270	457/317[2]	3,275	3.66	448.8	447.9	0.9
C	2,630	338/288[2]	1,821	6.59	449.4	448.6	0.8
D	2,800	580	4,554	2.63	450.9	449.9	1.0
E	3,680	418	2,898	3.90	452.1	451.2	0.9
F	4,450	304	1,636	6.91	454.9	454.1	0.8
G	5,700	377	2,681	4.21	460.4	459.6	0.8
H	7,440	308	2,307	5.07	464.5	463.5	1.0
I	9,000	290	2,025	5.78	469.4	468.9	0.5
J	11,220	352	2,752	4.25	476.4	475.9	0.5
K	11,780	182	1,434	6.07	478.1	477.3	0.8
L	13,490	200	970	6.70	485.7	484.8	0.9
M	15,030	141	1,265	5.14	497.1	496.1	1.0
N	16,370	106	505	12.87	514.0	514.0	0.0
O	17,050	124	993	5.34	520.6	520.6	0.0
P	17,930	78	403	13.15	523.8	523.6	0.2
Q	18,920	258	740	6.22	533.3	533.2	0.1

[1]Stream distance in feet above confluence.

[2]Total width/width within Garland corporate limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

FLOODWAY DATA

STREAM 2D1 - MILLS BRANCH

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Stream 2D3							
A	240	55	311	9.34	471.7	470.7[2]	1.0
B	2,210	68	500	5.80	490.6	489.6	1.0
C	3,320	64	239	9.21	497.6	497.6	0.0
D	4,770	52	225	9.78	511.0	511.0	0.0
Bradfield Creek							
A	2,300	302	1,634	3.67	458.7	458.4	0.3
B	4,000	100	768	7.81	474.6	474.1	0.5
C	4,920	90	807	7.44	479.1	478.7	0.4
D	6,600	55	593	10.11	486.8	486.7	0.1
E	8,000	35	383	11.60	497.7	497.7	0.0
F	9,500	50	516	8.63	510.3	510.3	0.0
G	11,150	70	568	7.83	521.1	520.5	0.6
H	12,070	130	490	7.05	525.2	525.2	0.0

[1]Stream distance in feet above confluence.
[2]Water-surface elevation determined without considering backwater effects from Mills Branch.

TABLE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

FLOODWAY DATA

STREAM 2D3-BRADFIELD CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Stream 2D14							
A	3,440	240	544	3.03	483.8	482.8	1.0
B	4,040	45	221	7.47	489.5	488.9	0.6
C	4,340	100	931	1.77	495.9	495.9	0.0
D	5,290	86	194	8.51	501.6	501.6	0.0
E	6,340	161/100[3]	412	4.00	518.2	518.2	0.0
Stream 2D4							
A	3,570	29	146	13.01	492.2	492.2	0.0
B	5,170	37	216	8.80	515.2	514.5	0.7
Stream 2D5							
A	1,740	176	855	4.21	490.8	489.8[2]	1.0
B	2,450	170	793	4.55	493.5	492.5	1.0
C	3,710	100	333	6.91	499.6	499.2	0.4
D	5,090	137	569	4.04	506.0	506.0	0.0
E	5,350	53	421	5.46	509.9	509.9	0.0
F	6,050	70	259	8.88	513.3	512.8	0.5

[1]Stream distance in feet above confluence.
[2]Water-surface elevation determined without considering backwater effects from Rowlett Creek.
[3]Total width/width within Garland corporate limits.

TABLE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration
CITY OF GARLAND, TX
(DALLAS CO.)

FLOODWAY DATA

STREAM 2D14-STREAM 2D4-STREAM 2D5

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Stream 2D6							
A	1,000	48	179	10.00	497.2	497.2	0.0
B	1,880	35	189	9.51	506.7	506.7	0.0
Spring Creek							
A	2,450	696	8,009	3.15	487.2	486.2[2]	1.0
B	5,130	790	8,513	2.96	489.1	488.2	0.9
C	6,850	653	6,260	4.03	491.0	490.0	1.0
D	8,820	798	6,733	3.76	493.2	492.2	1.0
E	11,330	441	3,825	7.61	497.1	496.3	0.8
F	15,180	421	4,322	5.90	508.9	508.4	0.5
G	17,030	477	6,033	4.23	512.6	511.7	0.9
H	20,530	387	5,121	5.04	519.2	518.2	1.0
I	22,450	394	4,825	5.35	522.7	521.7	1.0
J	25,570	683	7,317	3.58	527.1	526.1	1.0
K	29,770	474	4,796	5.46	533.9	532.9	1.0
L	30,850	579	5,418	4.84	536.6	535.6	1.0
M	32,180	601	5,207	5.03	539.0	538.1	0.9
N	35,250	576	5,212	5.24	545.0	544.1	0.9
O	36,690	443	3,748	7.28	549.2	548.5	0.7
P	37,290	525	6,412	4.26	551.8	551.4	0.4

[1]Stream distance in feet above confluence.
[2]Water-surface elevation determined without considering backwater effects from Rowlett Creek.

TABLE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

FLOODWAY DATA

STREAM 2D6-SPRING CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Stream 2I1							
A	760	24	151	8.61	490.2	489.2[2]	1.0
B	1,410	42	144	9.03	495.2	495.0	0.2
Stream 2I2							
A	270	41	573	5.32	485.4	484.4[2]	1.0
B	450	49	342	8.92	485.4	484.4[2]	1.0
C	1,550	51	243	12.55	493.4	493.4	0.0
D	2,650	65	263	11.60	509.7	509.7	0.0
E	4,200	72	433	6.93	523.4	523.4	0.0
Stream 2I3							
A	1,770	89	1,016	3.30	506.8	505.8	1.0
B	1,875	145	517	6.48	516.8	516.8	0.0
C	2,750	72	297	11.28	516.8	516.8	0.0
D	3,750	60	543	5.34	531.6	531.6	0.0

[1]Stream distance in feet above confluence.
[2]Water-surface elevation determined without considering backwater effects from Spring Creek.

TABLE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration
CITY OF GARLAND, TX
(DALLAS CO.)

FLOODWAY DATA

STREAM 211-STREAM 212-STREAM 213

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION		
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	WITH FLOODWAY (NGVD)	WITHOUT FLOODWAY (NGVD)	DIFFERENCE (FT.)
Stream 2I4							
A	850	240	970	3.40	514.4	513.4[3]	1.0
B	2,200	65	353	9.38	517.6	516.7	0.9
C	4,000	50	311	10.61	533.0	532.8	0.2
Stream 2I5							
A	2,500	40	139	8.63	529.8	529.8	0.0
B	3,290	57	190	6.05	536.7	536.2	0.5
Stream 2I6							
A	845	240	1,619	1.20	549.3	549.3	0.0
B	1,130	314	2,577	0.76	556.8	556.8	0.0
Stream 2I7							
A	840	379/20[2]	1,362	1.06	557.0	557.0	0.0

[1]Stream distance in feet above confluence.
[2]Total width/width within Garland corporate limits.
[3]Water-surface elevation determined without considering backwater effects from Spring Creek.

TABLE 2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

FLOODWAY DATA

STREAM 214-STREAM 215-STREAM 216-STREAM 217

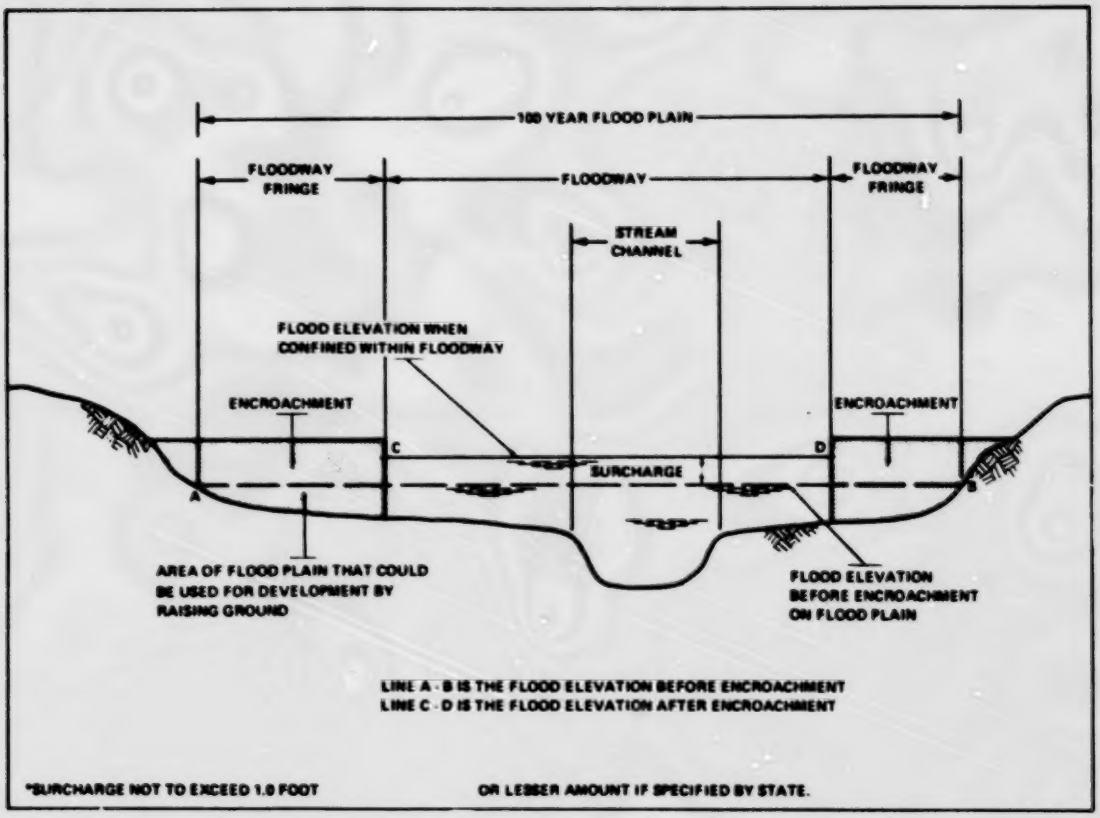
100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT
OR LESSER AMOUNT IF SPECIFIED BY STATE.

Figure 8 - Floodway Schematic

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, FEMA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each significant flooding source affecting the City of Garland.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This differences does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot

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Thirty-eight reaches meeting the above criteria were required for the flooding sources in the City of Garland.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their assigned FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the City of Garland was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.
Zones A1, A2, A3, A4 A5, A6, A7, A8 A9:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones assigned according to FHFs.
Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water-control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; or areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

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Table 3, "Flood Insurance Zone Data", summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the the City of Garland is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by FEMA.

6.0 OTHER STUDIES

This Flood Insurance Study is a revision of the February 1971, Type 10 Flood Insurance Study, City of Garland, Texas, by the COE (Reference 15).

The COE has published several reports which contain data related to the flood situation in Garland (References 13-16). The profiles used in these reports differ from those in the present study by as much as 2 feet in some reaches due primarily to the differences in watershed and stream conditions, the fact that more detailed field data were collected, and more sophisticated computations were made to develop the profiles used in this report. Since each of these studies were made by the COE, reconciliation of these differences was made within the agency. The Garland Storm Drainage Study dated January 1976 (Reference 17) contains 100-year frequency flood profiles for Streams 2C2, 2C5, 2C6 and 2I2. The flood profiles developed for this study differ from the profiles developed for the present study due primarily to the differences in methodology used to develop the hydrologic data used in the reports. The difference in the two reports was resolved during discussions with the Garland City Engineer. By letter dated July 26, 1977, the city engineer agreed to accept and use the profiles developed during the present study.

This study is authoritative for purposes of the Flood Insurance Program. Data presented herein either supersedes or is compatible with previous studies (References 1 and 13-17).

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of the Chief, Natural and Technological Hazards Division, Federal Emergency Management Agency, Federal Center, Denton, TX 76201.

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Duck Creek	05,						
Reach 1	15,20,30	-2.0	-0.5	1.2	020	A4	Varies
Stream 2 C1							
Reach 1	30	-1.0	-0.3	0.7	010	A2	Varies
Reach 2	30	-2.2	-0.9	1.8	020	A4	Varies
Reach 3	30	-1.1	-0.3	0.5	010	A2	Varies
Long Branch							
Reach 1	30	-1.3	-0.3	0.7	015	A3	Varies
Reach 2	30	-3.2	-0.8	1.7	030	A6	Varies
Reach 3	25	-1.3	-0.3	0.7	015	A3	Varies
Stream 2C2							
Reach 1	15,20,30	-1.3	-0.3	0.7	015	A3	Varies
Stream 2C3							
Reach 1	15	-2.1	-0.6	1.2	020	A4	Varies
Reach 2	15	-0.9	-0.2	0.5	010	A2	Varies
Reach 3	15	-1.7	-0.4	0.4	015	A3	Varies
Reach 4	15	-0.4	-0.1	0.3	005	A1	588

[1]Flood Insurance Rate Map Panel [2]Weighted Average [3]Rounded to Nearest Foot

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

FLOOD INSURANCE ZONE DATA

DUCK CREEK-STREAM 2C1-LONG BRANCH-STREAM 2C2 STREAM 2C3

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Stream 2C4							
Reach 1	15	-2.4	-1.2	2.8	025	A5	Varies
Reach 2	15	-0.9	-0.2	0.8	010	A2	Varies
Stream 2C5							
Reach 1	15	-2.0	-0.6	1.2	020	A4	Varies
Stream 2C6							
Reach 1	15	-1.2	-0.3	0.6	010	A2	Varies
Rowlett Creek							
Reach 1	20	-2.0	-0.6	1.5	020	A4	Varies
Reach 2	20	-3.8	-1.1	2.1	040	A8	Varies
Reach 3	10,20	-3.4	-1.0	1.9	035	A7	Varies
Reach 4	10	-4.7	-1.5	2.9	045	A9	Varies
Reach 5	10	-3.0	-0.9	1.8	030	A6	Varies
Stream 2D1							
Reach 1	20	-0.7	-0.2	0.4	005	A1	Varies

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT – SEE MAP

TABLE 3

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration
CITY OF GARLAND, TX
(DALLAS CO.)

FLOOD INSURANCE ZONE DATA

STREAM 2C4-STREAM 2C5-STREAM 2C6
ROWLETT CREEK-STREAM 2D1

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Mills Branch							
Reach 1	20	-1.5	-0.5	1.0	015	A3	Varies
Stream 2D3							
Reach 1	20	-1.2	-0.3	0.6	010	A2	Varies
Bradfield Creek							
Reach 1	20	-0.9	-0.3	0.4	010	A2	Varies
Reach 2	20	-2.3	-0.7	1.3	025	A5	Varies
Stream 2D14							
Reach 1	10	-0.7	-0.2	0.8	005	A1	Varies
Stream 2D4							
Reach 1	10	-1.4	-0.4	0.8	015	A3	Varies
Stream 2D5							
Reach 1	05,10	-0.9	-0.2	0.4	010	A2	Varies

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT – SEE MAP

TABLE 3

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

FLOOD INSURANCE ZONE DATA

MILLS BRANCH-STREAM 2D3-BRADFIELD CREEK-STREAM 2D14-STREAM 2D4-STREAM 2D5

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Stream 2D6 Reach 1	05,10	-0.8	-0.2	0.5	010	A2	Varies
Spring Creek Reach 1	05,10	-2.6	-0.7	1.5	025	A5	Varies
Stream 2I1 Reach 1	10	-1.0	-0.2	0.6	010	A2	Varies
Stream 2I2 Reach 1	10	-1.2	-0.4	0.9	010	A2	Varies
Stream 2I3 Reach 1	05	-0.8	-0.2	0.4	010	A2	Varies

[1] FLOOD INSURANCE RATE MAP PANEL
[2] WEIGHTED AVERAGE
[3] ROUNDED TO NEAREST FOOT – SEE MAP

TABLE 3

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

FLOOD INSURANCE ZONE DATA

STREAM 2D6-SPRING CREEK-STREAM 2I1
STREAM 2I2-STREAM 2I3

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Stream 2I4 Reach 1	05	-1.0	-0.3	0.6	010	A2	Varies
Stream 2I5 Reach 1	05	-0.9	-0.3	0.7	010	A2	Varies
Stream 2I6 Reach 1	05	-1.2	-0.3	1.5	010	A2	Varies
Stream 2I7 Reach 1	05	-0.4	-0.1	0.1	005	A1	Varies
Lake Ray Hubbard Reach 1	20,30	-1.5	-0.0	0.0	015	A3	437

[1]Flood Insurance Rate Map Panel
[2]Weighted Average
[3]Rounded to the nearest foot - see map

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

FLOOD INSURANCE ZONE DATA

STREAM 214-STREAM 215-STREAM 216
STREAM 217-LAKE RAY HUBBARD

8.0 BIBLIOGRAPHY AND REFERENCES

1. U.S. Geological Survey, Flood Prone Area Maps: Garland, Texas, Rowlett, Texas, White Rock, Texas, and Mesquite, Texas, all dated 1973.

2. U.S. Army Corps of Engineers, Routing of Floods Through River Channels, EM 1110-2-1408, March, 1960.

3. National Weather Service, Technical Paper No. 40, Rainfall Frequency Atlas of the United States, May, 1961.

4. U.S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Davis, California, February, 1972.

5. U.S. Geological Survey, 7.5 Minute Quadrangle Maps: Garland, Texas dated 1959 and photorevised in 1967 and 1973; Rowlett, Texas dated 1959 and photorevised in 1966 and 1973; White Rock, Texas dated 1958 and photorevised in 1968 and 1973; and Mesquite, Texas dated 1959 and photorevised in 1968 and 1973.

6. Western Air Maps, Inc., Orthophoto Contour Maps, Garland, Texas: Scale 1"=200', Contour Interval 2', date of photography March 21, 1980; Lenexa, Kansas.

7. John C. Gibson Co., Inc.: Camelot Addition No. 11, Garland, Texas: Scale 1"=100', February 24, 1978, Dallas, Texas.

8. John C. Gibson Co., Inc.: Spring Creek Park, Garland, Texas: Scale 1"=100', May 2, 1978, Dallas, Texas.

9. John C. Gibson Co., Inc.: Drainage Area Map, Regal Estates, Garland, Texas: Scale 1"=100', Contour Interval 1', June, 1970, Dallas, Texas.

10. Graham Associates, Inc.: Final Plat, Springpark Central, 7th Addition, Garland, Texas: Scale 1"=60', Contour Interval 1', May 8, 1977, Dallas, Texas.

11. M.E. Bennett Engineers, Inc.: Final Plat, Northlake Estates No. 10, Garland, Texas: Scale 1"=100', as built April 14, 1980, Garland, Texas.

12. John C. Gibson Co., Inc.: LaPrada No. 8, Garland, Texas: Scale 1"=100', September 27, 1978, Dallas, Texas.

13. U.S. Army Corps of Engineers, Flood Plain Information Report, Duck Creek, Garland, Texas, March, 1968.

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14. U.S. Army Corps of Engineers, Design Memorandum No. 1 on Duck Creek Channel Improvement, Garland, Texas, April, 1970.

15. U.S. Army Corps of Engineers, Type 10 Flood Insurance Study, Garland, Texas, February, 1971.

16. U.S. Army Corps of Engineers, Flood Plain Information Report, Rowlett Creek, Part 1, January, 1973.

17. Henningson, Durham and Richardson, Inc. of Texas, Garland Storm Drainage Study, January, 1976.

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TEXT REVISIONS
CITY OF GARLAND, TEXAS

9.0 REVISION DESCRIPTION

9.1 Purpose

The purpose of this revision is to incorporate new and/or revised data into the currently effective Flood Insurance Study for the City of Garland, Dallas County, Texas. This Revision Description is intended to provide updated information which aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

9.2 Acknowledgments

The detailed topographic information for this Revision Description were performed by R. Delta Engineers, Inc., of Garland, Texas. The Federal Emergency Management Agency (FEMA) reviewed and accepted this data for purposes of this revision.

9.3 Scope

This revision reflects a redelineation of the 100-year flood plain boundary along Stream 2I3 downstream of Apollo Road near the confluence with Spring Creek. Also, a reduction of the 100-year boundary along Stream 2I7 just south of Lake Shore Drive was incorporated as granted by a previous Letter of Map Amendment (LOMA).

9.4 Revisions Bibliography

1. R. Delta Engineers, Inc. of Garland , Texas, Onofore Alvarado Survey, Abstract No. 2, Scale 1" = 40', Contour Interval 1 Foot: Dallas County, Texas, November 26, 1984.

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REACH 1
ZONE A4

CORPORATE LIMITS

CORPORATE LIMITS

CITY OF GARLAND ON LEFT BANK

BROADWAY BOULEVARD

CONFLUENCE OF STREAM 2C1

ELEVATION (FEET NGVD)

460
450
440
430
420
410

26 27 28 29 30 31 32 33 34 35 36 37 38 39

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

DUCK CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

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REACH 1
ZONE A4

CITY OF GARLAND

CITY OF GARLAND ON LEFT BANK

CORPORATE LIMITS

CORPORATE LIMITS

CITY OF MESQUITE

CORPORATE LIMITS

CITY OF GARLAND

ELEVATION (FEET NGVD)

480
470
460
450
440
430
420

FONTAGE ROAD

STATE HWY 67 & INTERSTATE HWY 30

FONTAGE ROAD

CONFLUENCE OF LONG BRANCH

OATES ROAD

D
E
F

39 40 41 42 43 44 45 46 47 48 49 50 51 52

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- A — CROSS SECTION LOCATION

WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

DUCK CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

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REACH 1
ZONE A4

ELEVATION (FEET NGVD)

510
500
490
480
470
460
450

CENTERVILLE ROAD
CONFLUENCE STREAM 2C2

G H I J K L M

52 53 54 55 56 57 58 59 60 61 62 63 64 65

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE

LEGEND
- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- A — CROSS SECTION LOCATION

WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

DUCK CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

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REACH 1
ZONE A4

ELEVATION (FEET NGVD)

550
540
530
520
510
500
490
480
470

65 66 67 68 69 70 71 72 73 74 75 76 77 78

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE

CONFLUENCE OF STREAM 2C3

KINGSLEY ROAD

BRIARWOOD DRIVE

MILLER ROAD

GULF COAST & SANTA FE R.R.

GLENBROOK DRIVE

AVENUE F

STATE HWY 78

GARLAND AVENUE

N O P Q R S T U

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- A — CROSS SECTION LOCATION

WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

DUCK CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

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REACH 1
ZONE A4

AVENUE D
FOREST LANE
CONFLUENCE OF STREAM 2C5
STATE STREET
MISSOURI-KANSAS & TEXAS R.R.
WALNUT STREET
SHILOH ROAD
BUCKINGHAM ROAD
CHANNEL DAM
CONFLUENCE OF STREAM 2C6

ELEVATION (FEET NGVD)

580
570
560
550
540
530
520
510

78 79 80 81 82 83 84 85 86 87 88 89 90 91

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE

V W X Y Z AA

LEGEND
- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- A — CROSS SECTION LOCATION

WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

DUCK CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

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REACH 1
ZONE A4

CITY OF GARLAND

CORPORATE LIMITS

CITY OF RICHARDSON

LIMIT OF DETAILED STUDY

ELEVATION (FEET NGVD)

600
590
580
570
560
550

CONCRETE CHANNEL DAM

CHANNEL DAM

BELTLINE ROAD

JUPITER ROAD

AB
AC
AD

91 92 93 94 95 96 97 98 99

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- A — CROSS SECTION LOCATION

WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

DUCK CREEK

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

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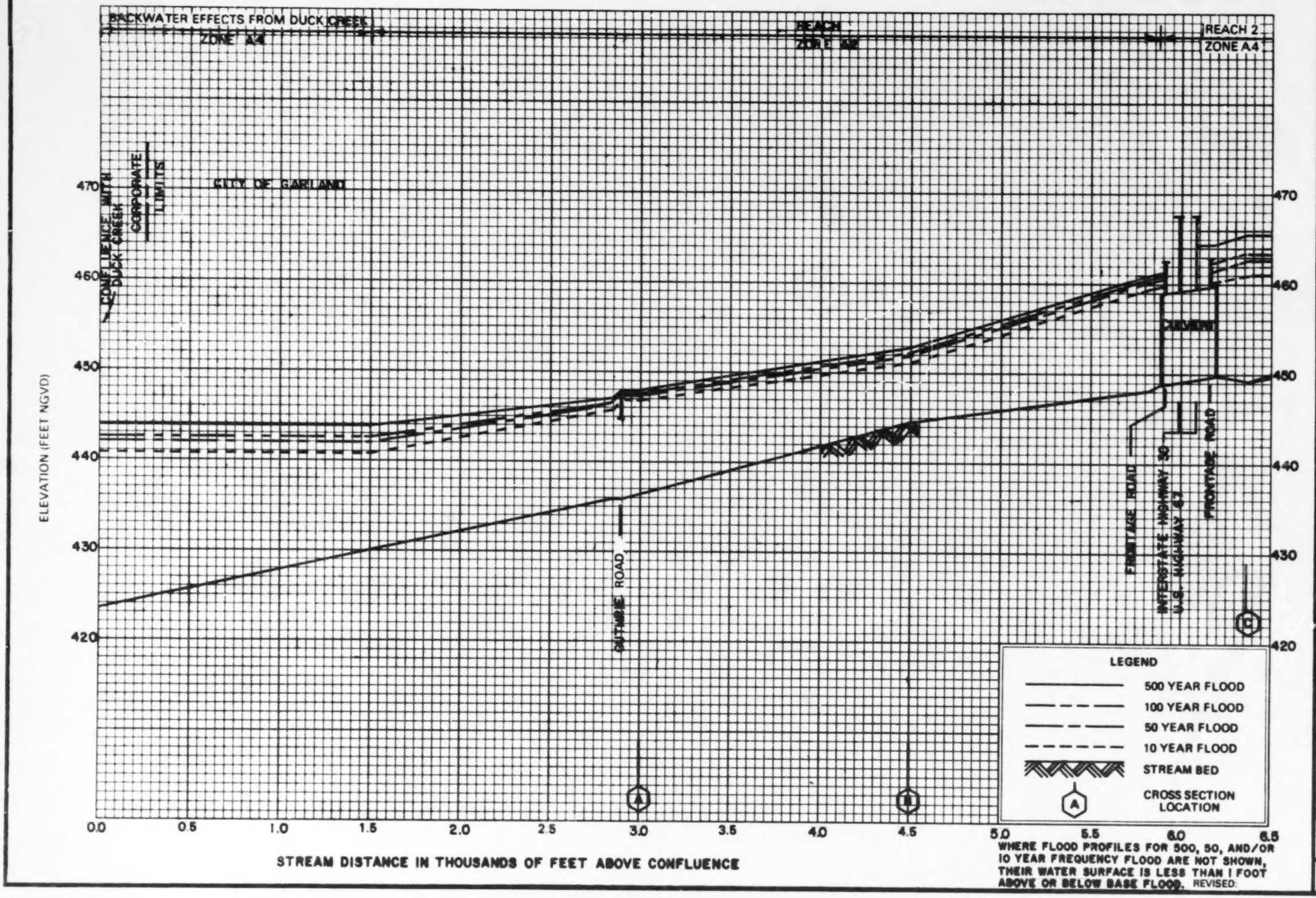

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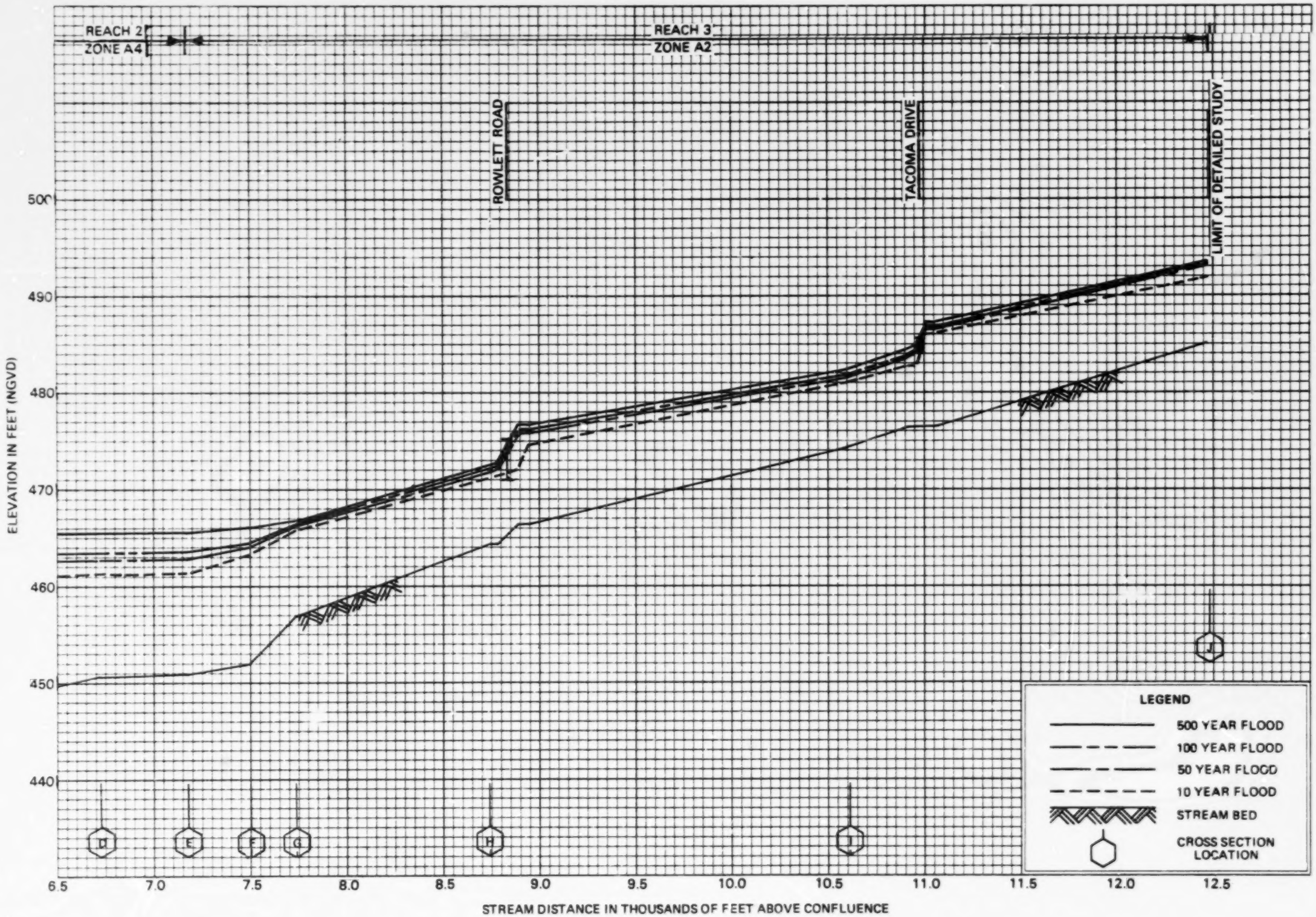

FLOOD PROFILES

STREAM 2C1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

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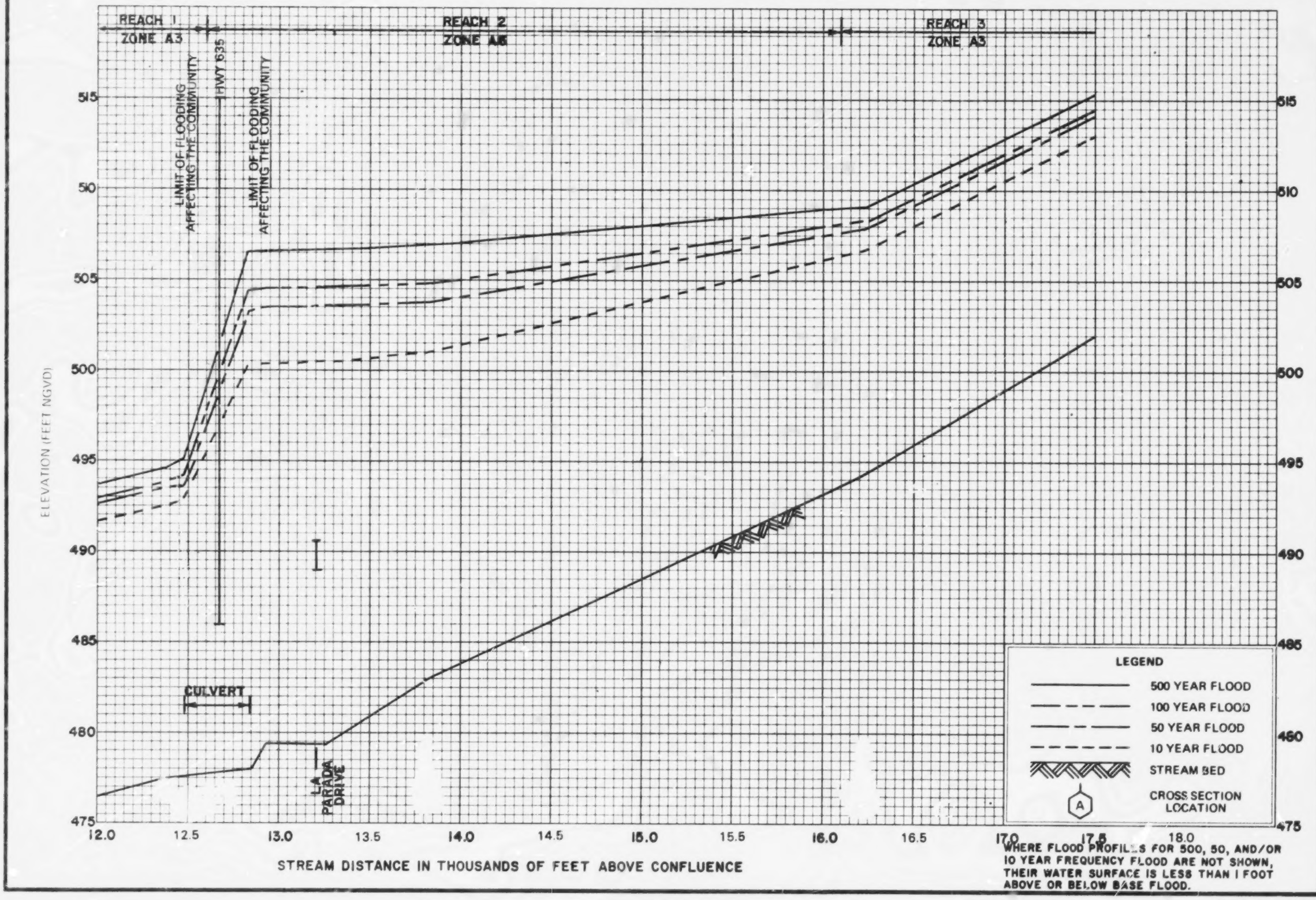

FLOOD PROFILES

LONG BRANCH

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

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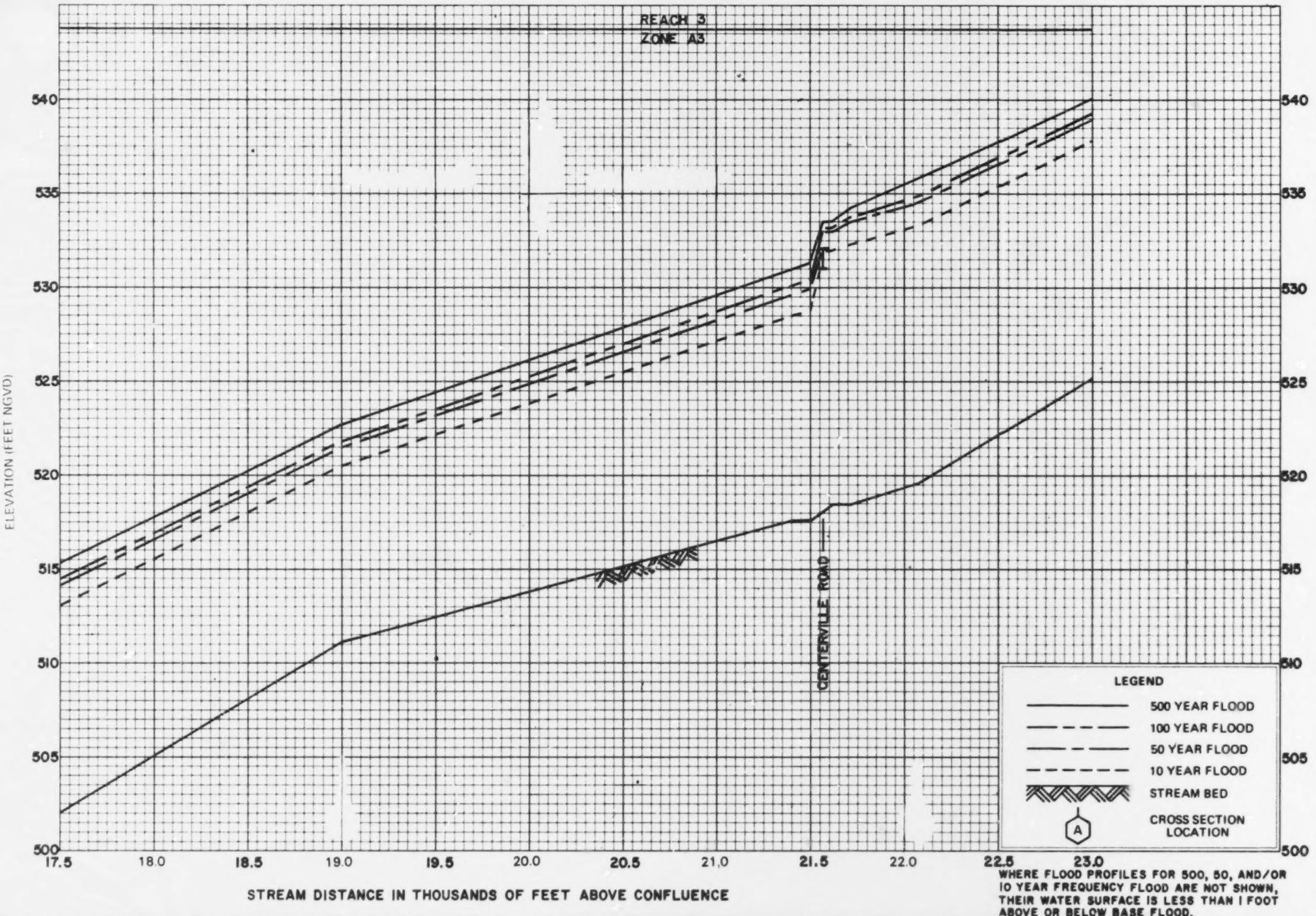


WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

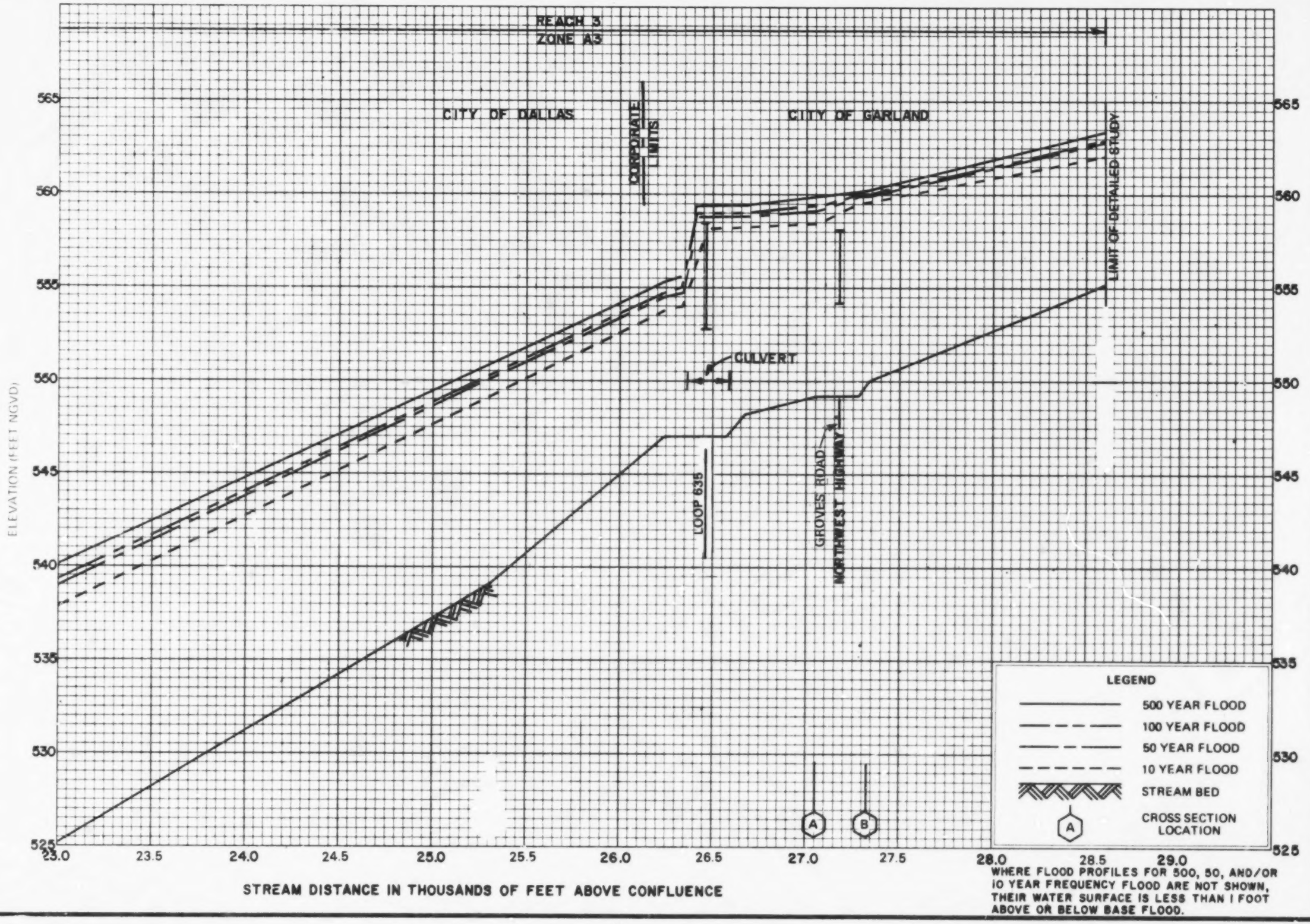
FLOOD PROFILES

LONG BRANCH

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

10P



FLOOD PROFILES

LONG BRANCH

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

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BACKWATER EFFECTS FROM DUCK CREEK

ZONE A4

REACH 1

ZONE A3

PRIVATE DRIVE

PRIVATE DRIVE

CONFLUENCE WITH DUCK CREEK

GLENBROOK DRIVE

LIMIT OF DETAILED STUDY

CULVERT

SATURN ROAD

DOUGLAS DRIVE

CARROLL DRIVE

ELEVATION (FEET NGVD)

550
540
530
520
510
500
490
480
470

0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE

A
B
C
D
E

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- A — CROSS SECTION LOCATION

WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

STREAM 2C2

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

12P

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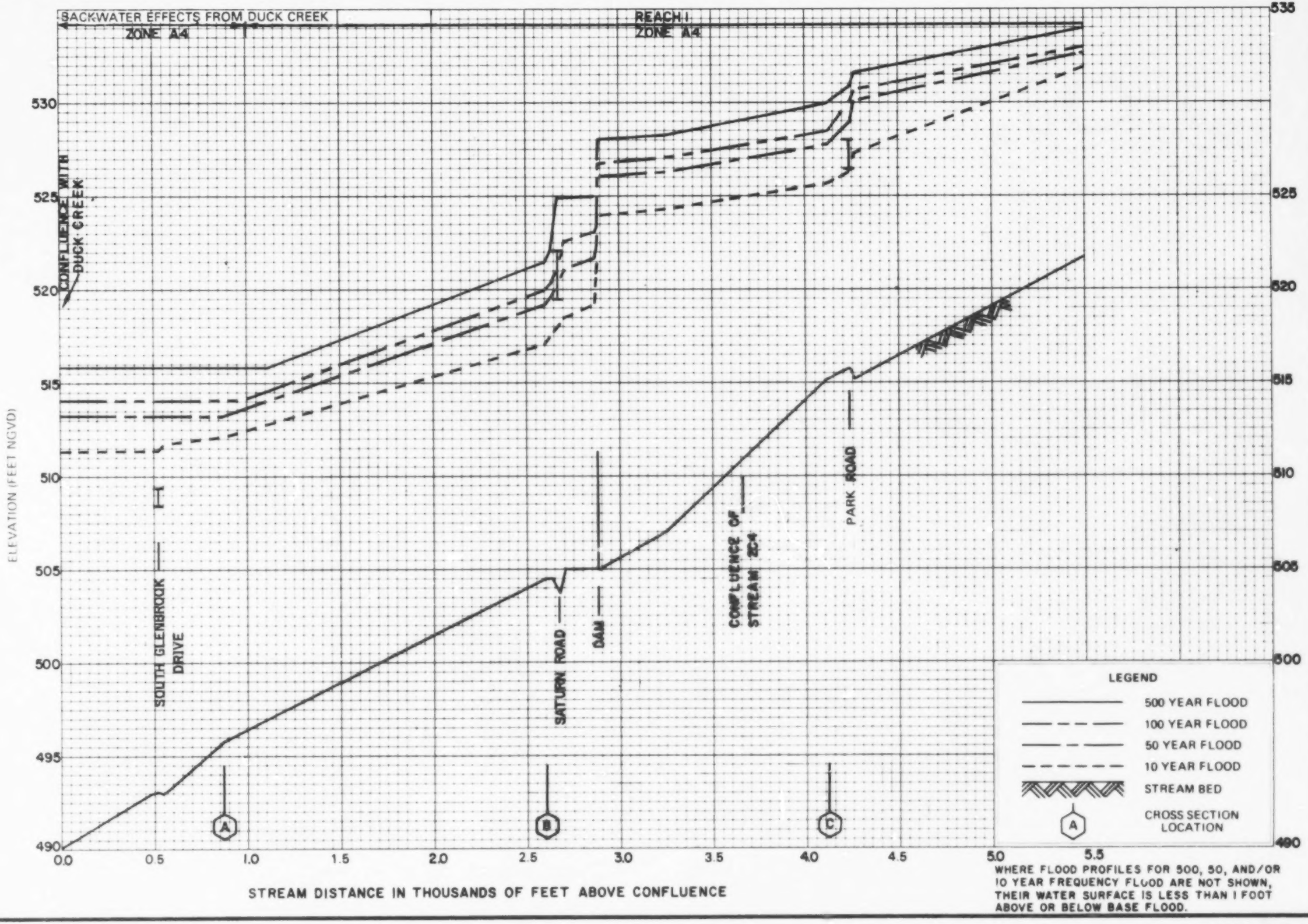

FLOOD PROFILES

STREAM 2C3

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

13 P

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REACH 1
ZONE A4

REACH 2
ZONE A2

ELEVATION (FEET NGVD)

560
555
550
545
540
535
530
525
520

BULF COAST & SANTA FE RAIL ROAD

SOUTH GARLAND AVENUE

PATRICIA LANE

NEW CASTLE DRIVE

D
E
F
G

5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- (A) CROSS SECTION LOCATION

WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

STREAM 2C3

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

14P

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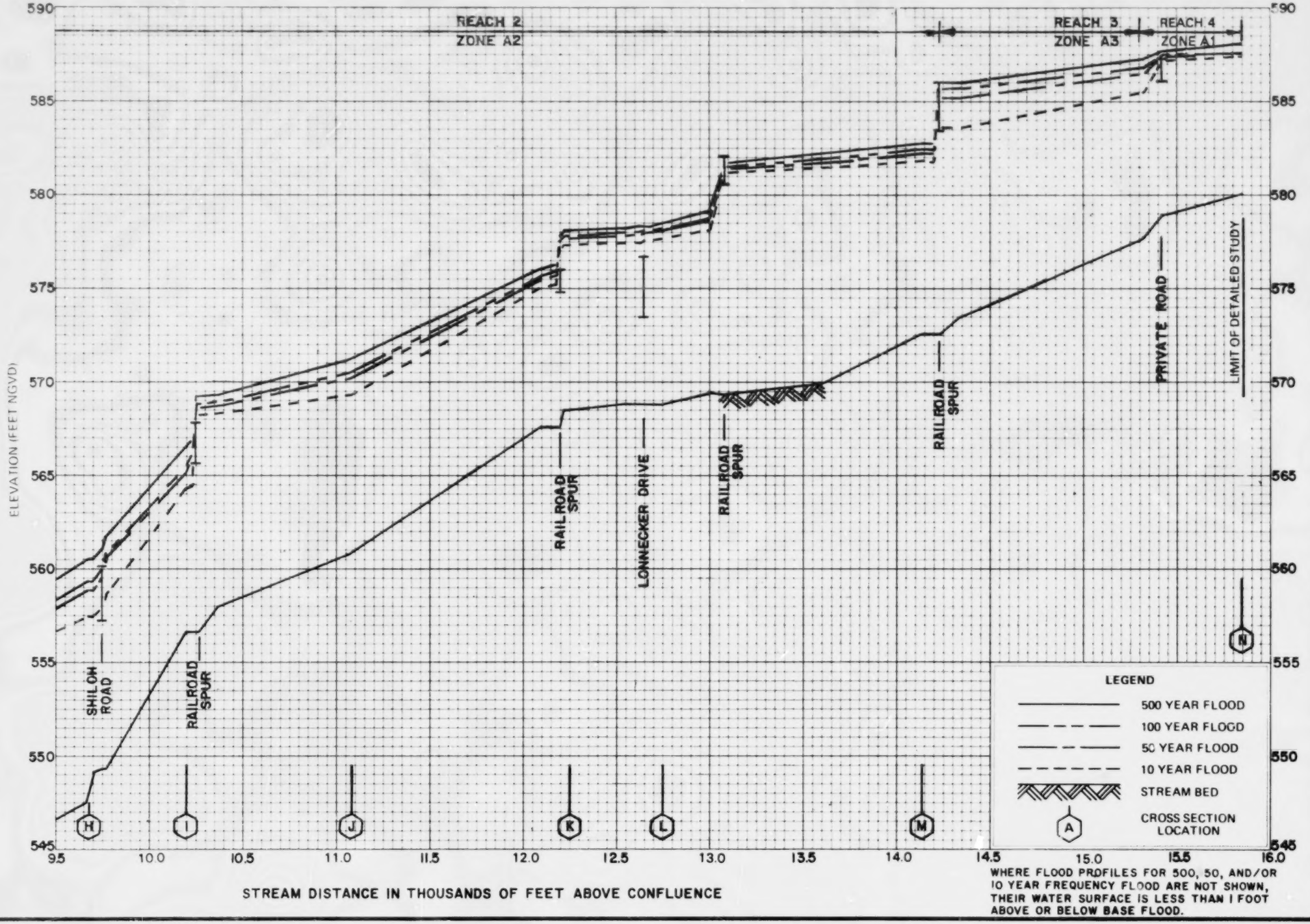

FLOOD PROFILES

STREAM 2C3

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

15P

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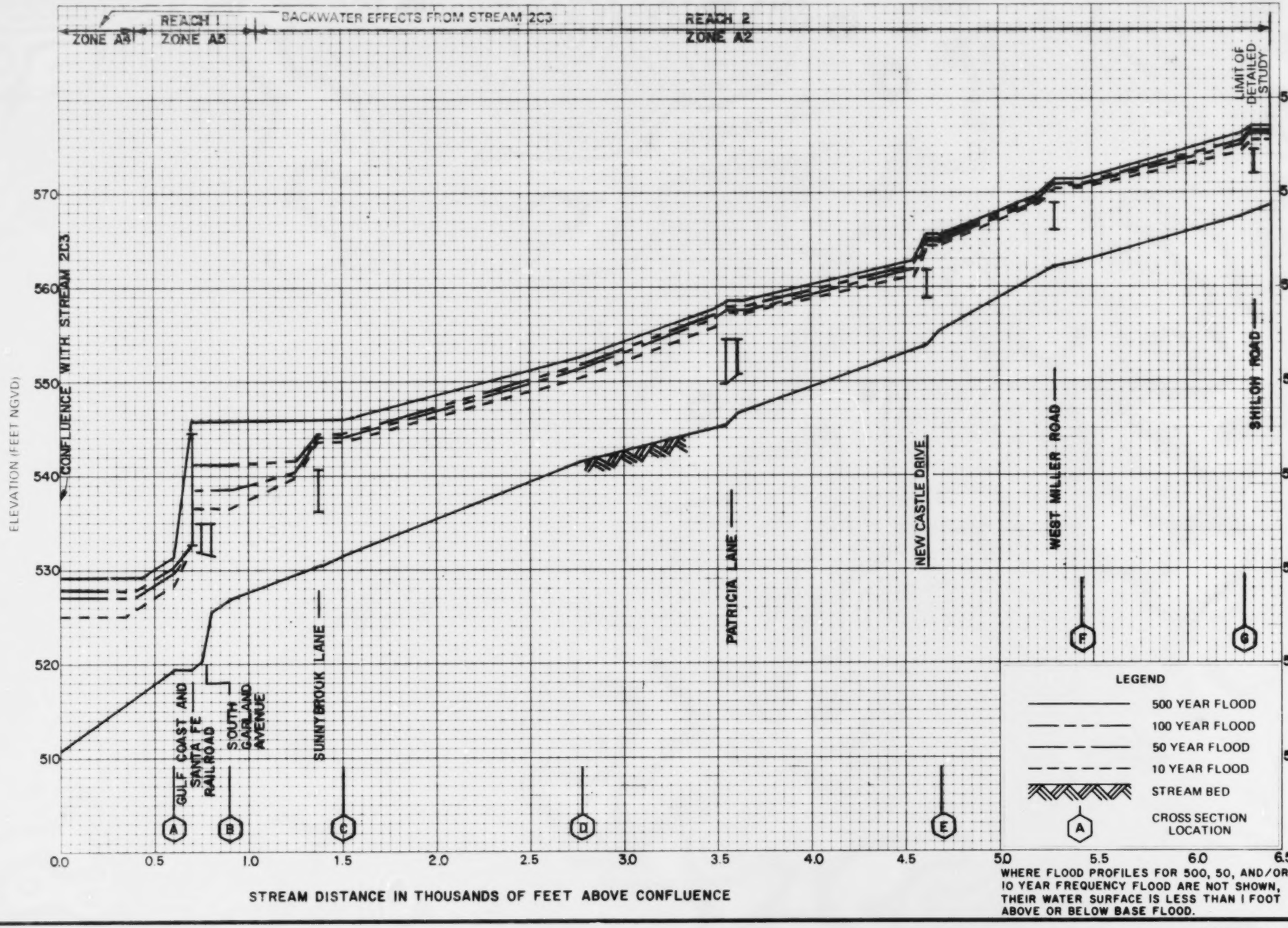

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FLOOD PROFILES

STREAM 2C4

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

16P

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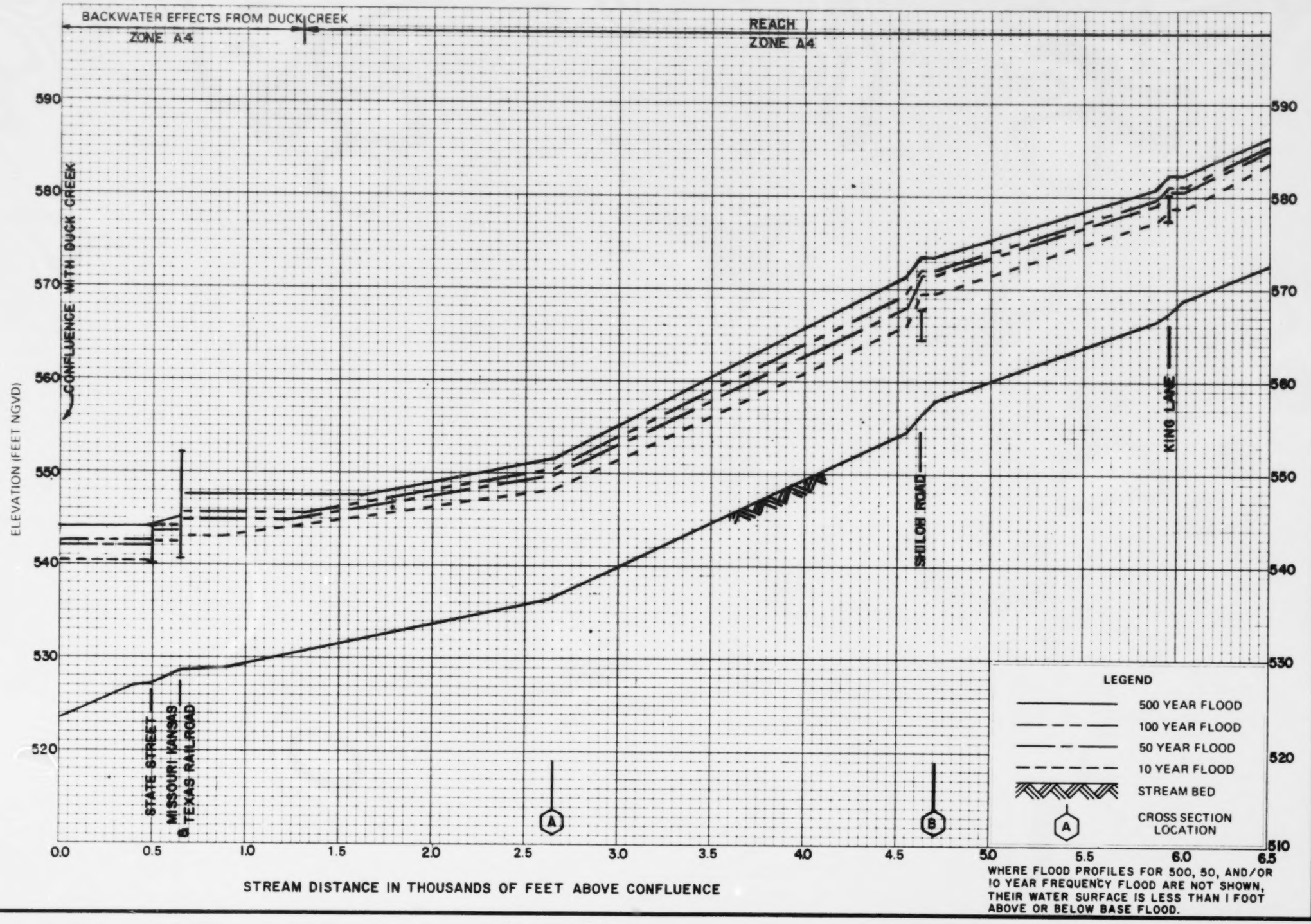

FLOOD PROFILES

STREAM 2C5

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

17P

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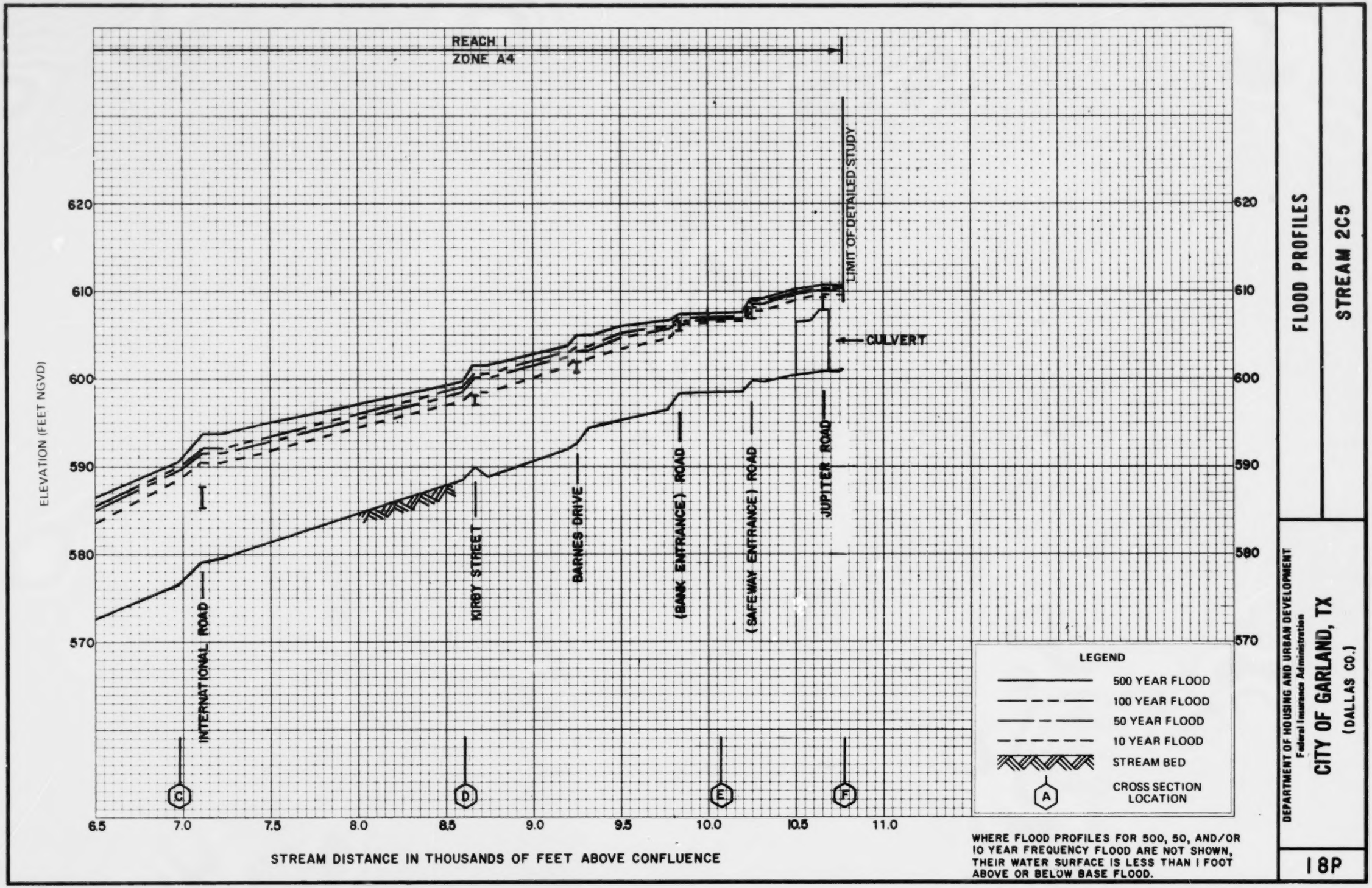

WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

STREAM 2C5

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
Federal Insurance Administration

CITY OF GARLAND, TX
(DALLAS CO.)

18P

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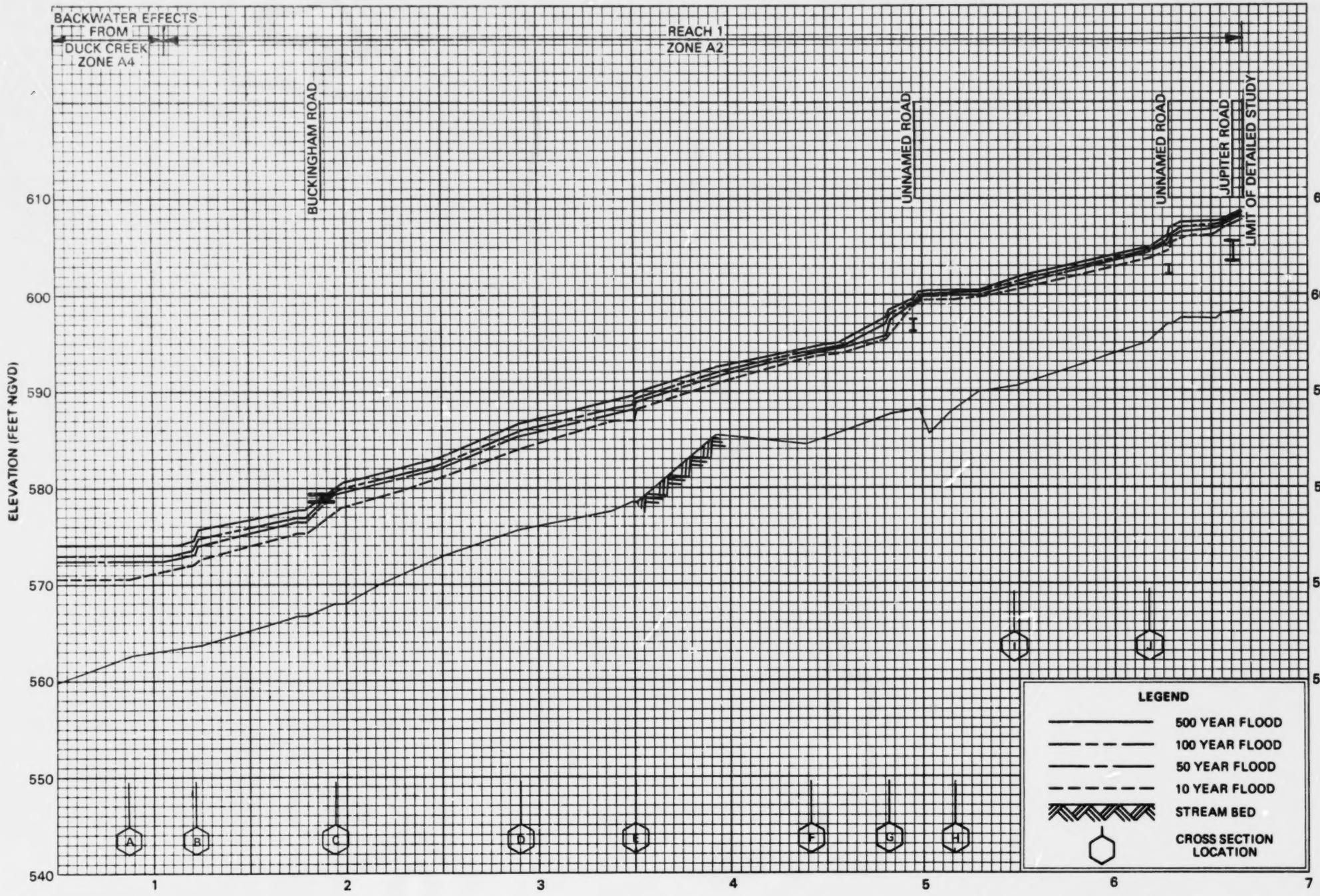

FLOOD PROFILES

STREAM 2C6

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

19P

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REACH 1
ZONE A4

REACH 2
ZONE A8

REACH 3
ZONE A7

BACKWATER EFFECTS FROM LAKE RAY HUBBARD
ZONE A3

ELEVATION (FEET NGVD)

460
450
440
430
420
410

ROWLETT ROAD
CONFLUENCE OF STREAM 2D1
MILLER ROAD
CORPORATE LIMITS
CONFLUENCE OF MILLS BRANCH
MISSOURI KANSAS & TEXAS RAILROAD
CONFLUENCE OF BRADFIELD CREEK
GARLAND AVENUE
STATE HWY 66
(NEW) STATE HWY 66
CORPORATE LIMITS
CASTILE DRIVE

A B C D E F

30 32 34 36 38 40 42 44 46 48 50 52 54

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- CROSS SECTION LOCATION

WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

ROWLETT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

20P

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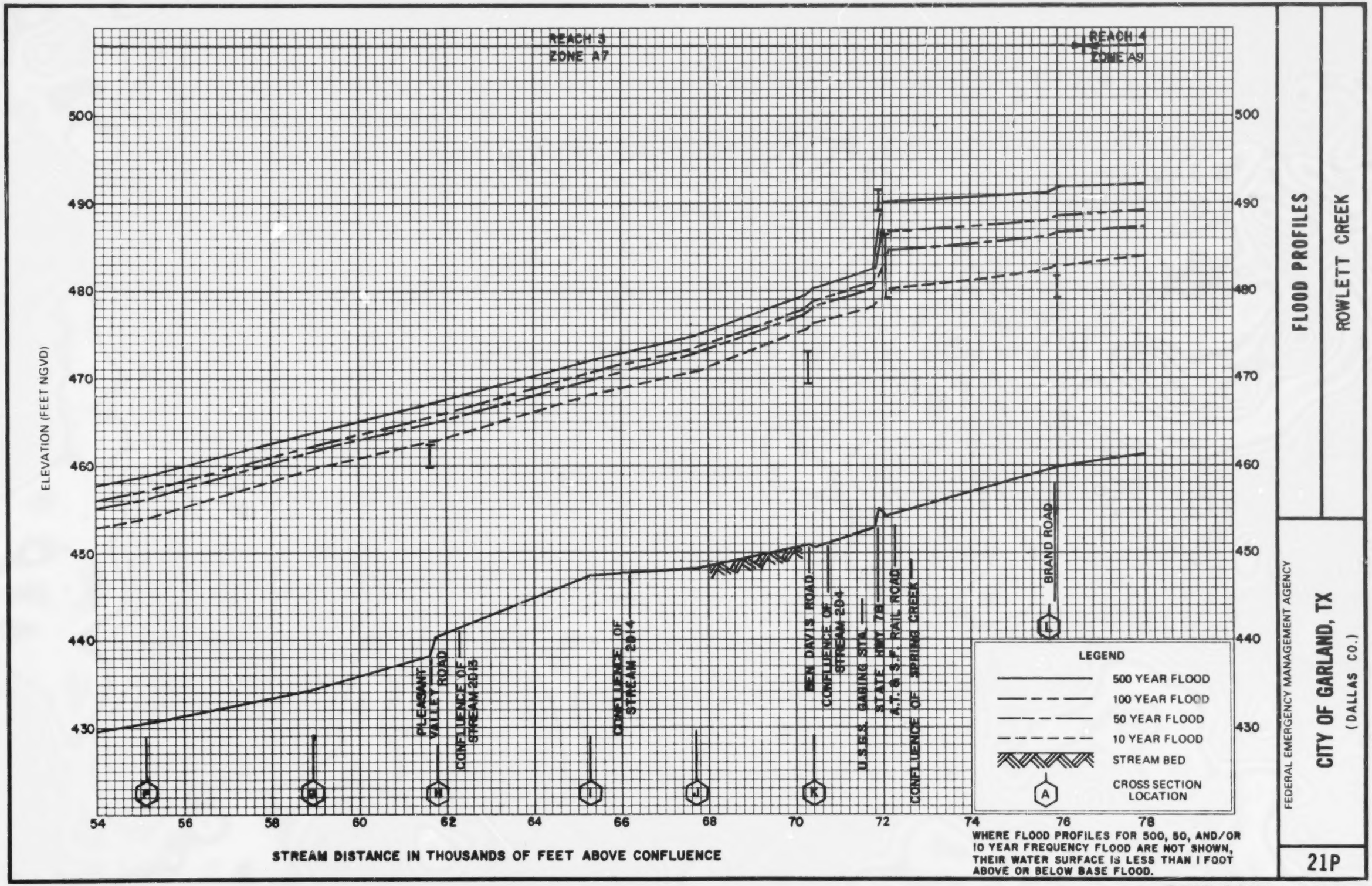

WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

ROWLETT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

21P

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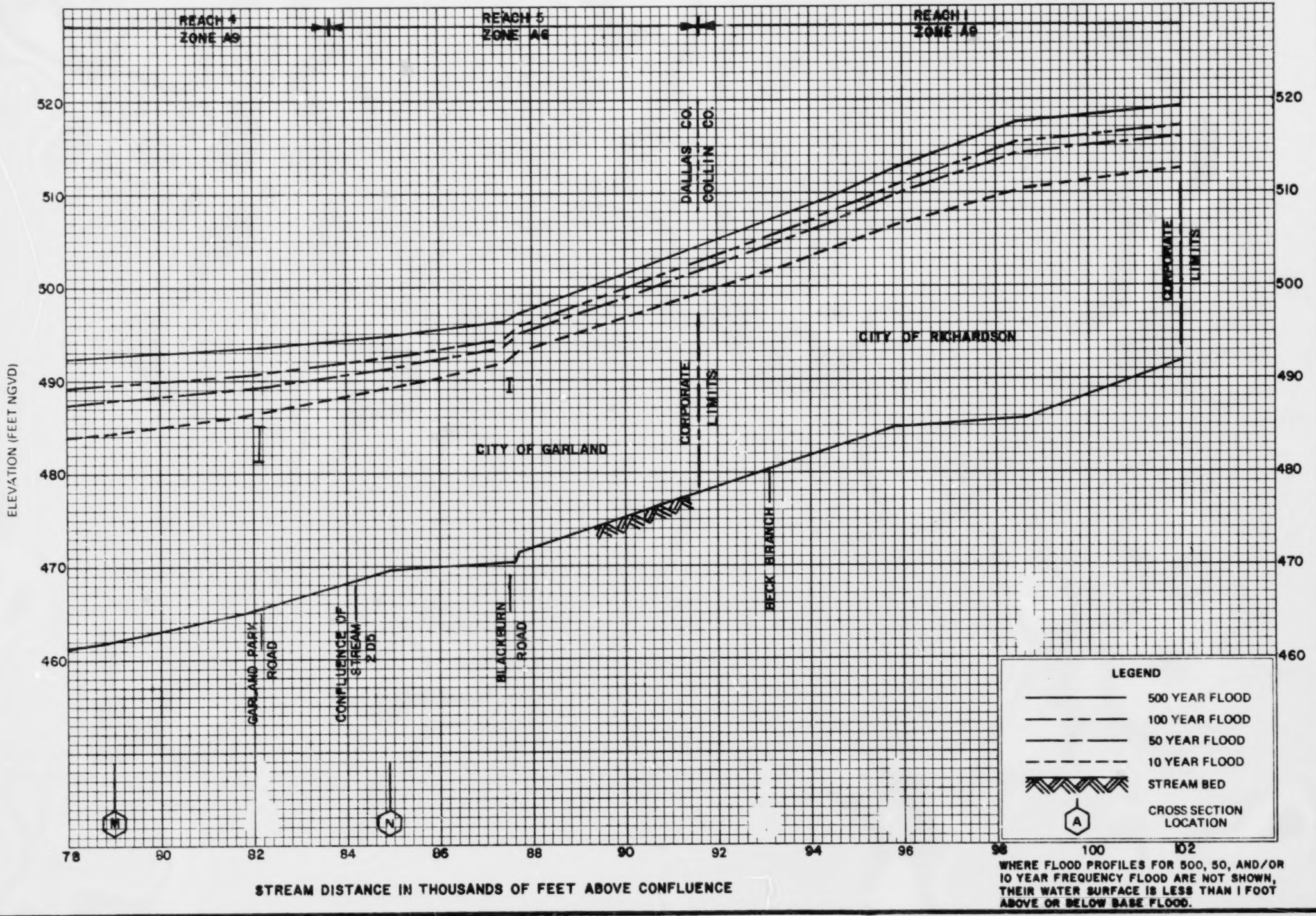

FLOOD PROFILES

ROWLETT CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

22P

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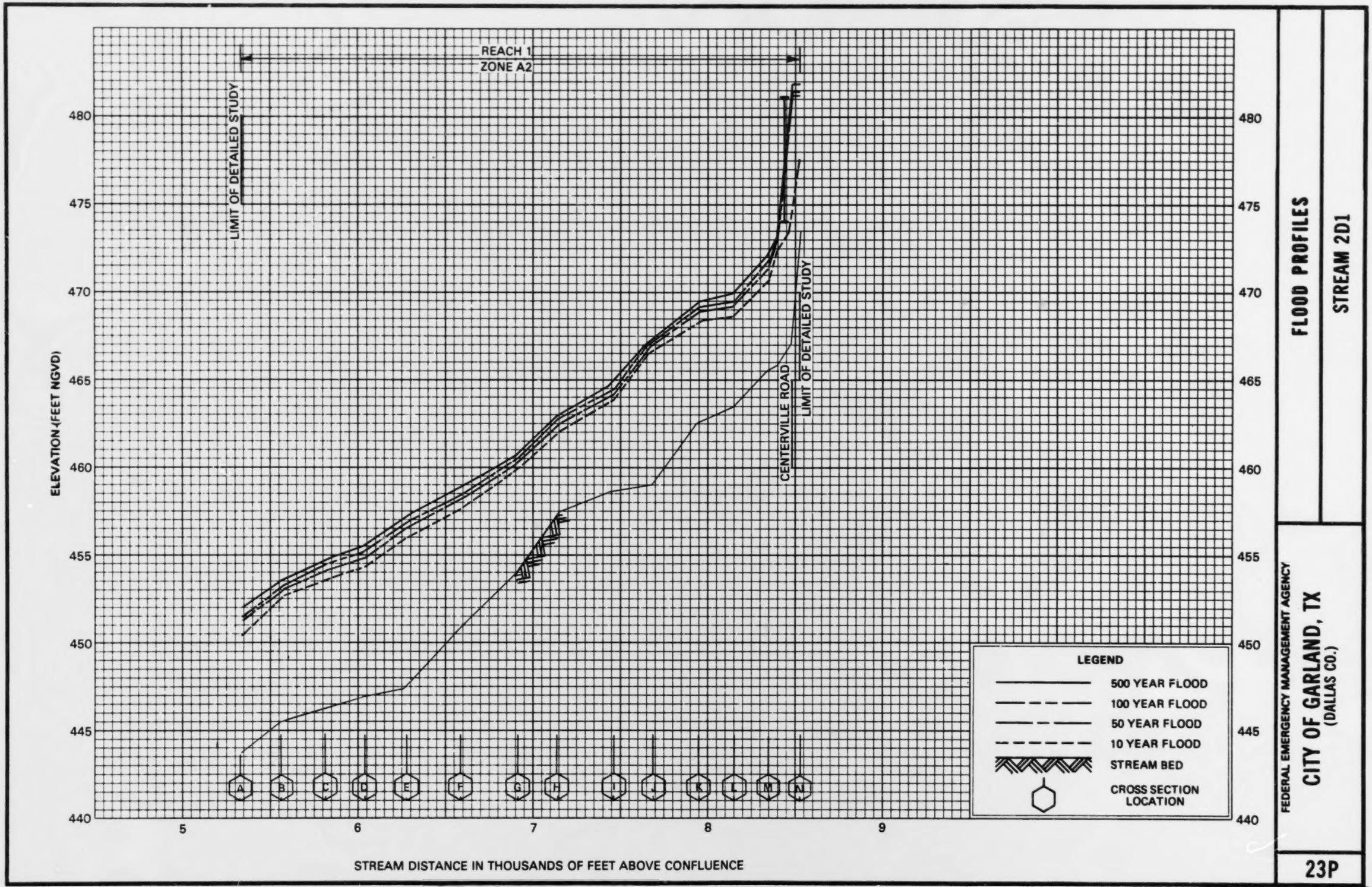

FLOOD PROFILES

STREAM 2D1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

23P

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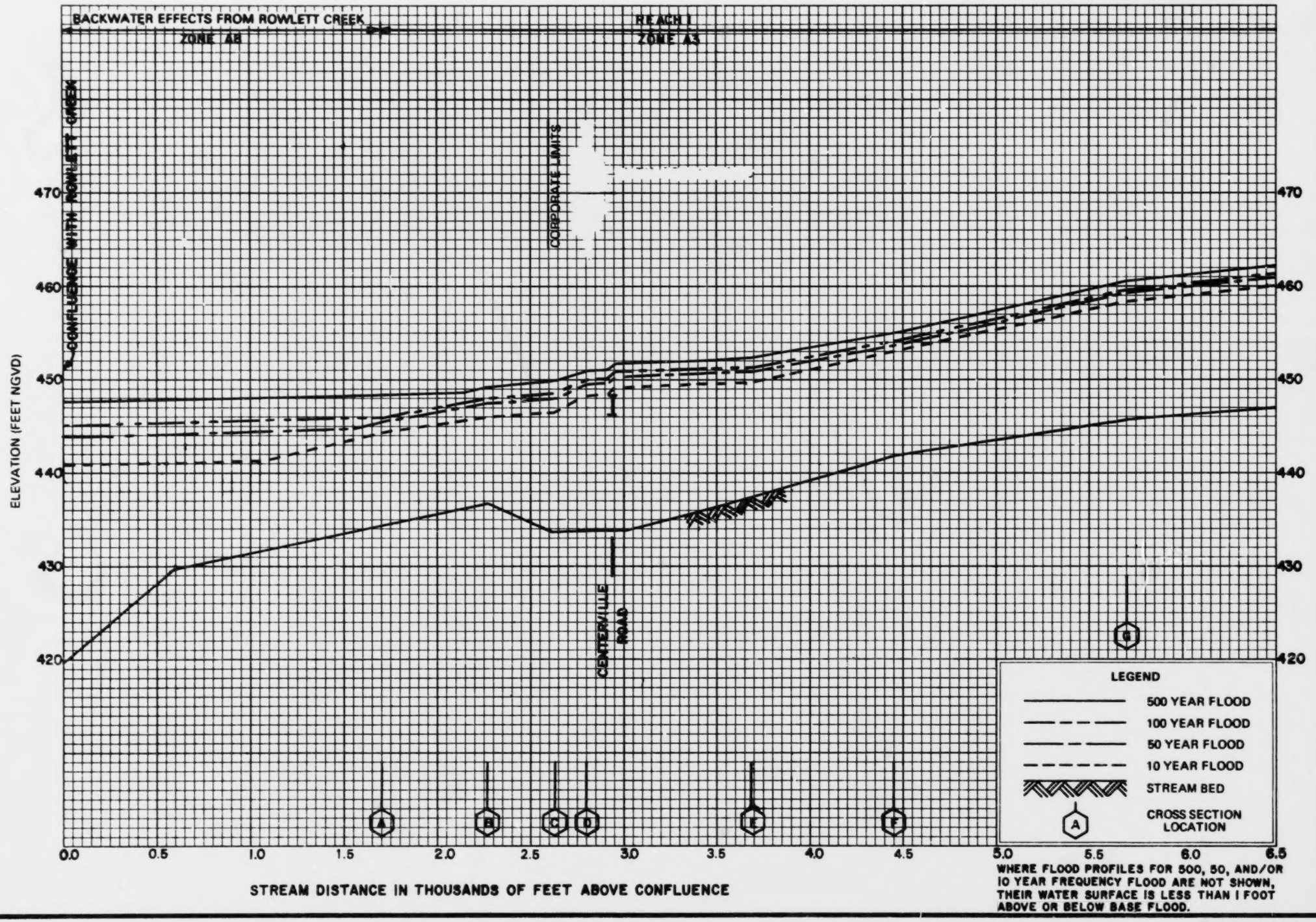

WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

MILLS BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

24P

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REACH 1
ZONE A3

ELEVATION (FEET NGVD)

490
480
470
460
450
440

CONFLUENCE OF STREAM 2D3
GARLAND AVENUE
OLD STATE HIGHWAY 66
NEW GARLAND AVENUE
NEW STATE HIGHWAY 66
DAVIDSON STREET

H
I
J
K

6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE

LEGEND

- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- A — CROSS SECTION LOCATION

WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

MILLS BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

25P

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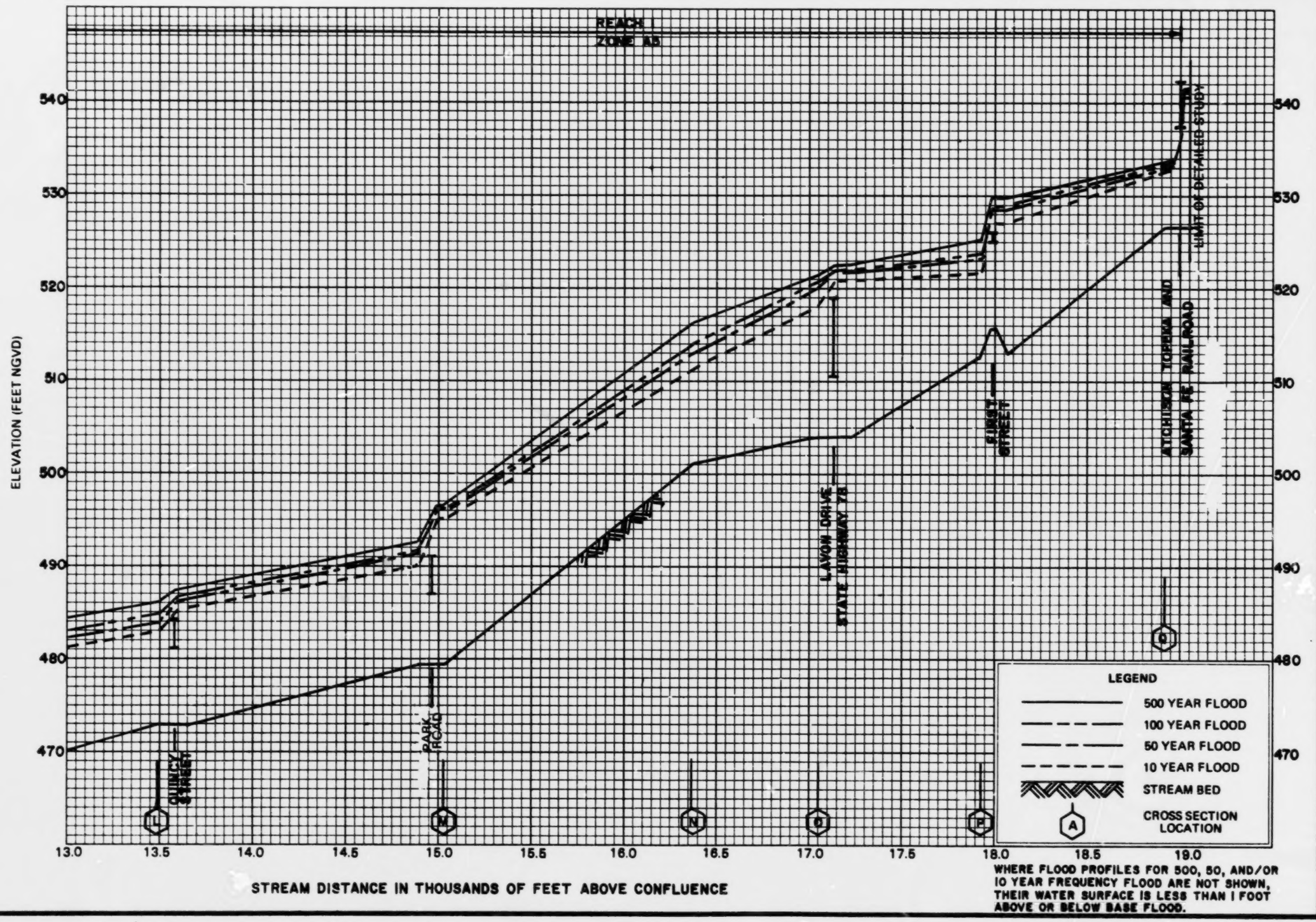

FLOOD PROFILES

MILLS BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

26P

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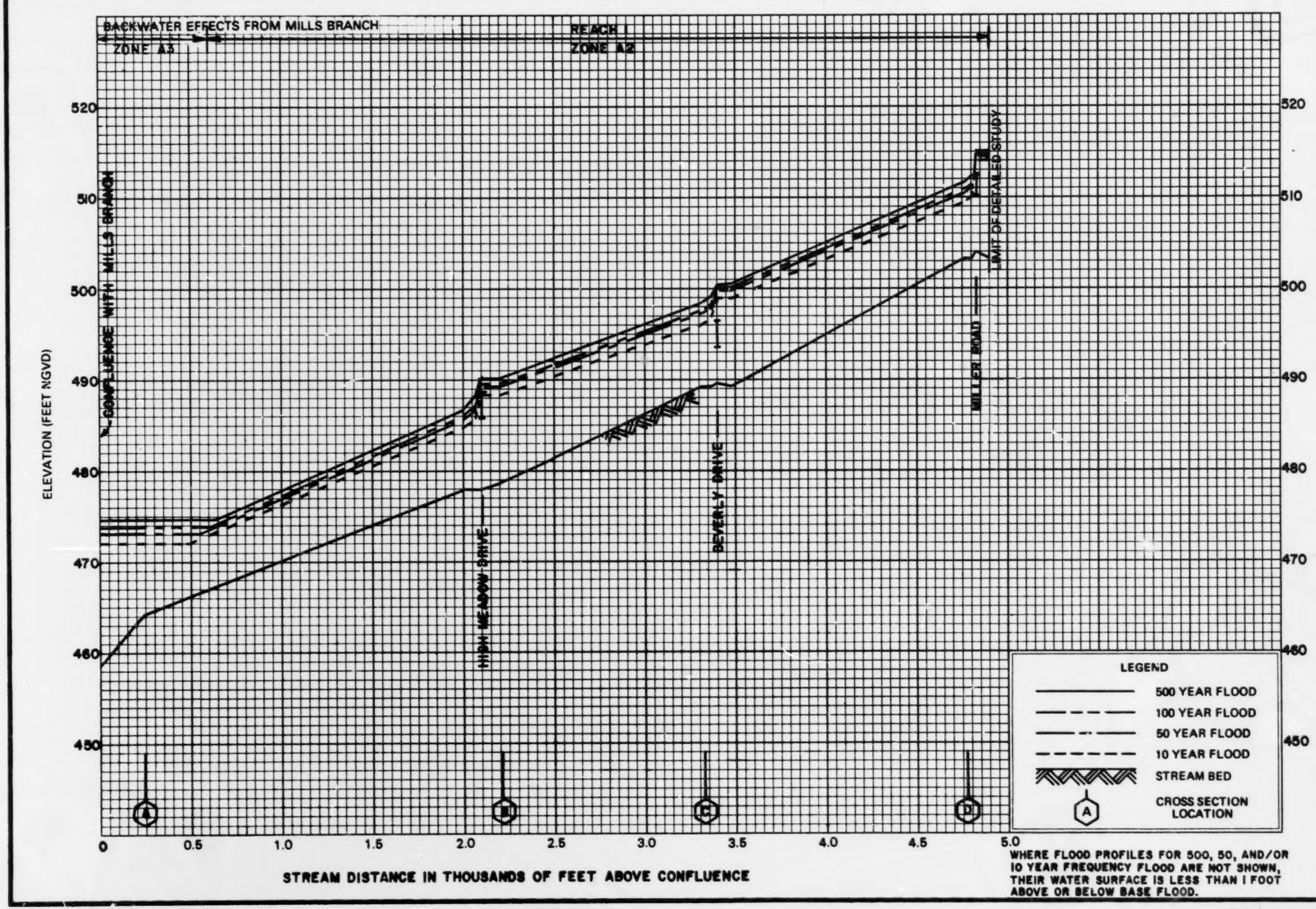

FLOOD PROFILES

STREAM 2D3

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX

(DALLAS CO.)

27P

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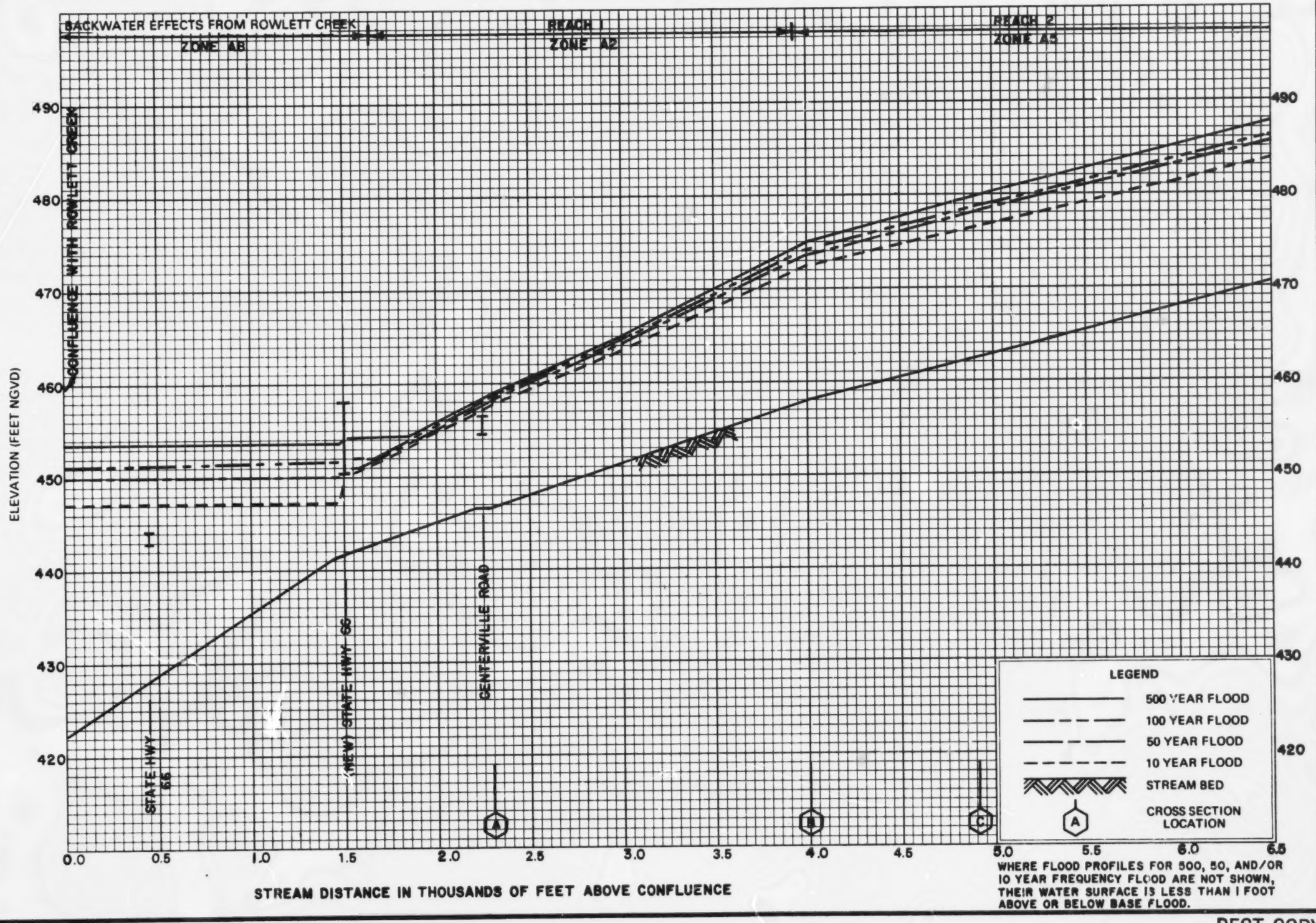

FLOOD PROFILES

BRADFIELD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

28P

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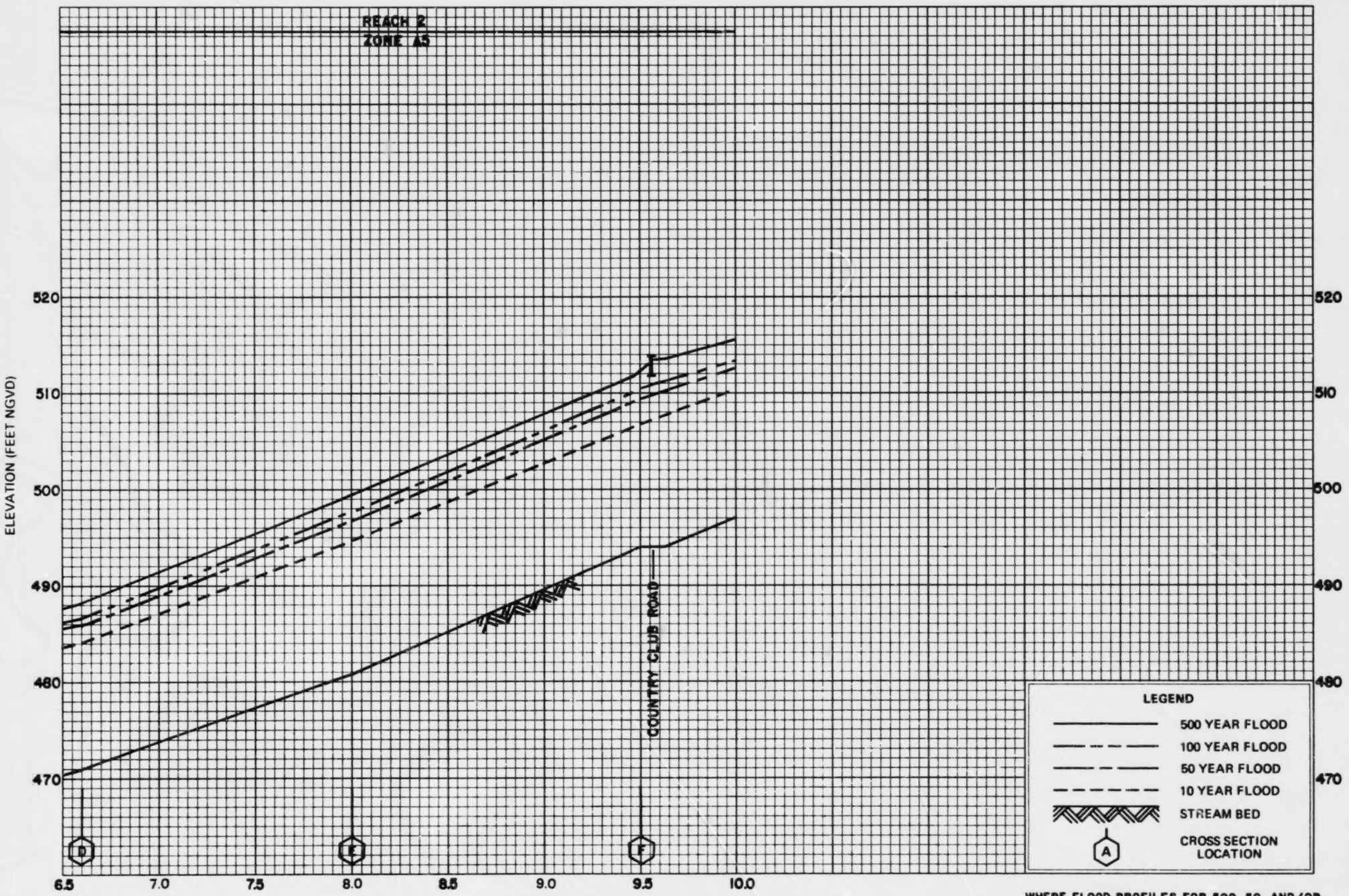
REACH 2
ZONE A5



STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE

WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

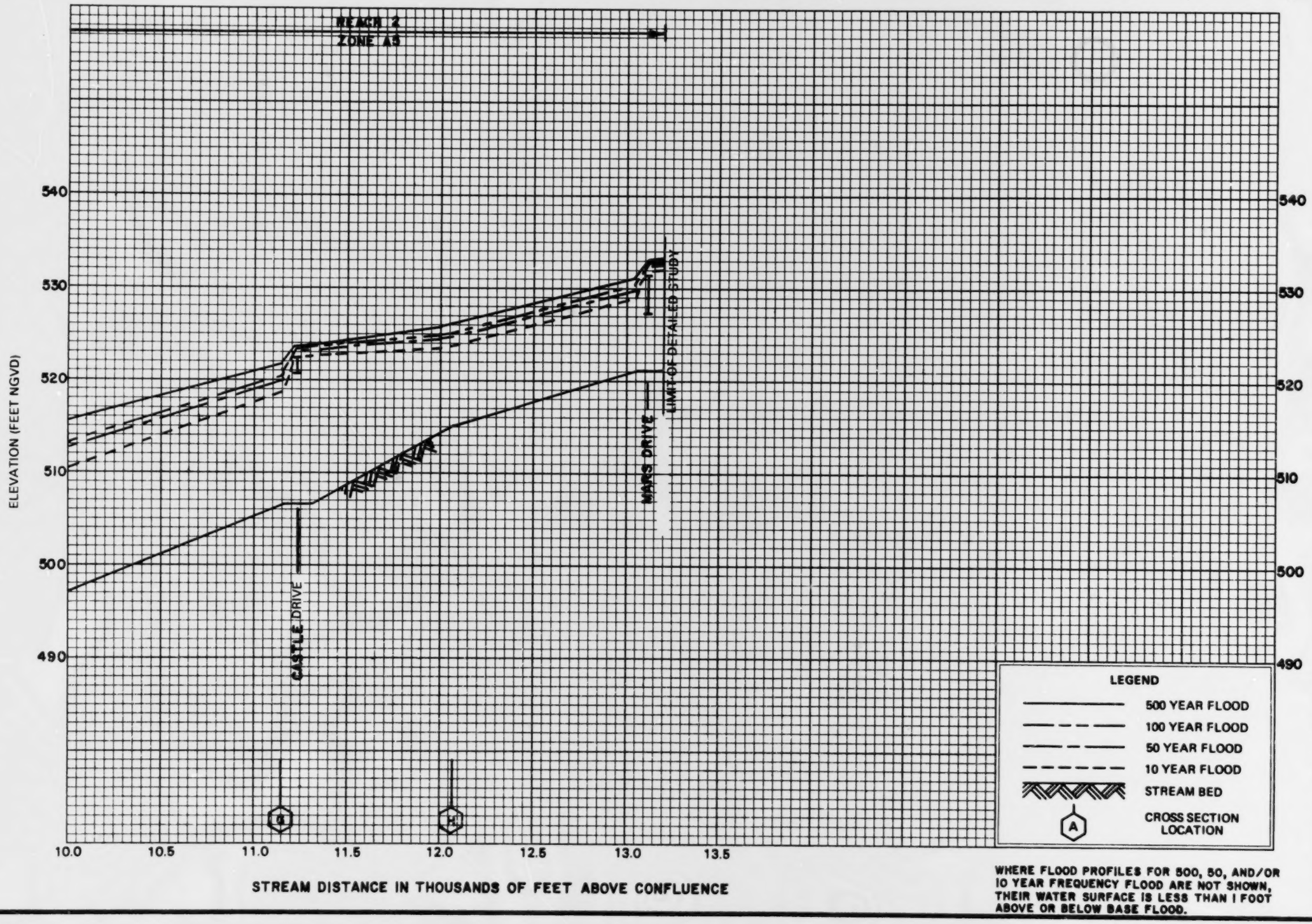
BRADFIELD CREEK

FEDERAL EMERGENCY MANAGMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

29P

BEST COPY AVAILABLE



FLOOD PROFILES

BRADFIELD CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

30P

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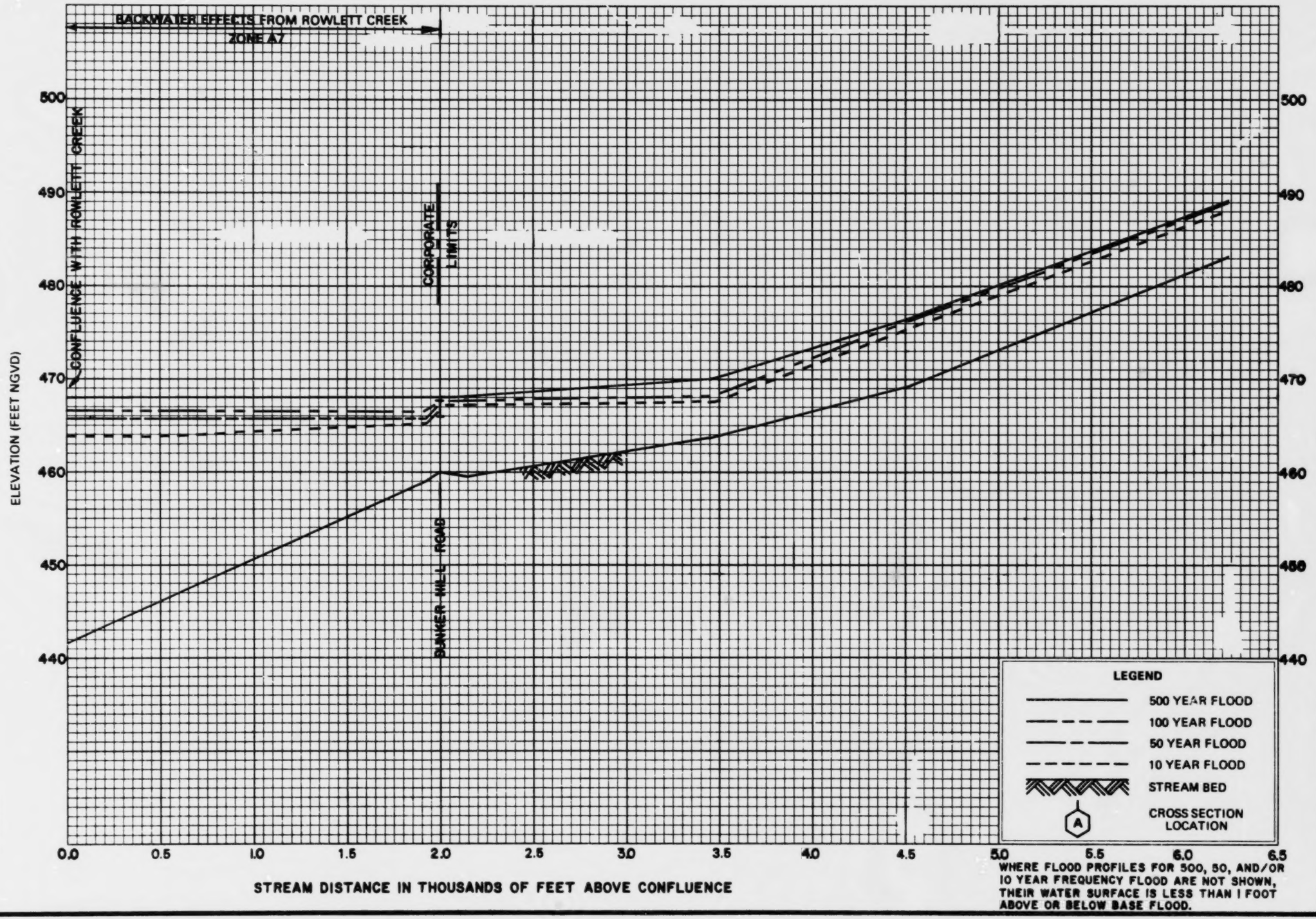

FLOOD PROFILES

STREAM 2D13

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX

(DALLAS CO.)

31P

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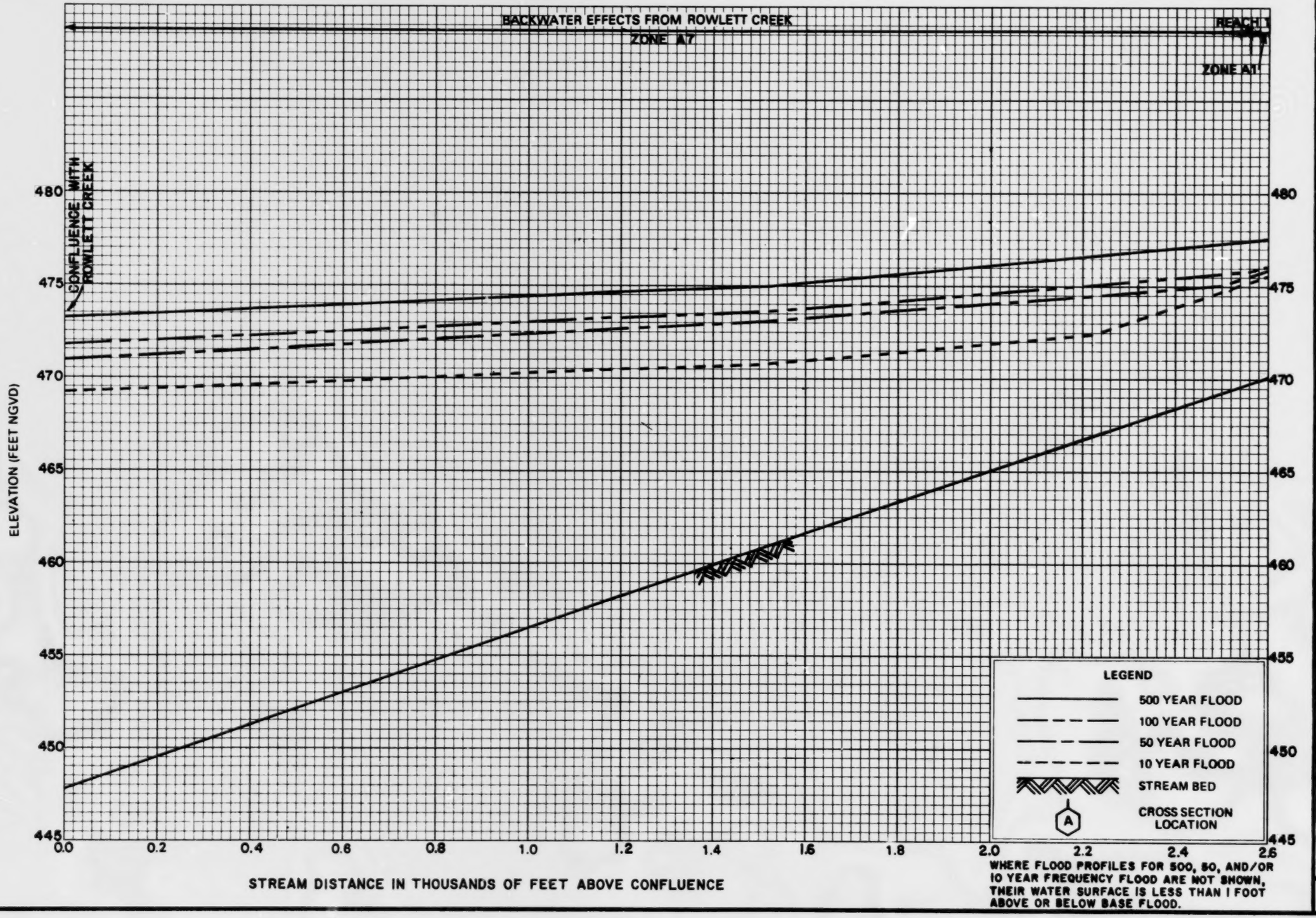

FLOOD PROFILES

STREAM 2D14

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX

(DALLAS CO.)

32P

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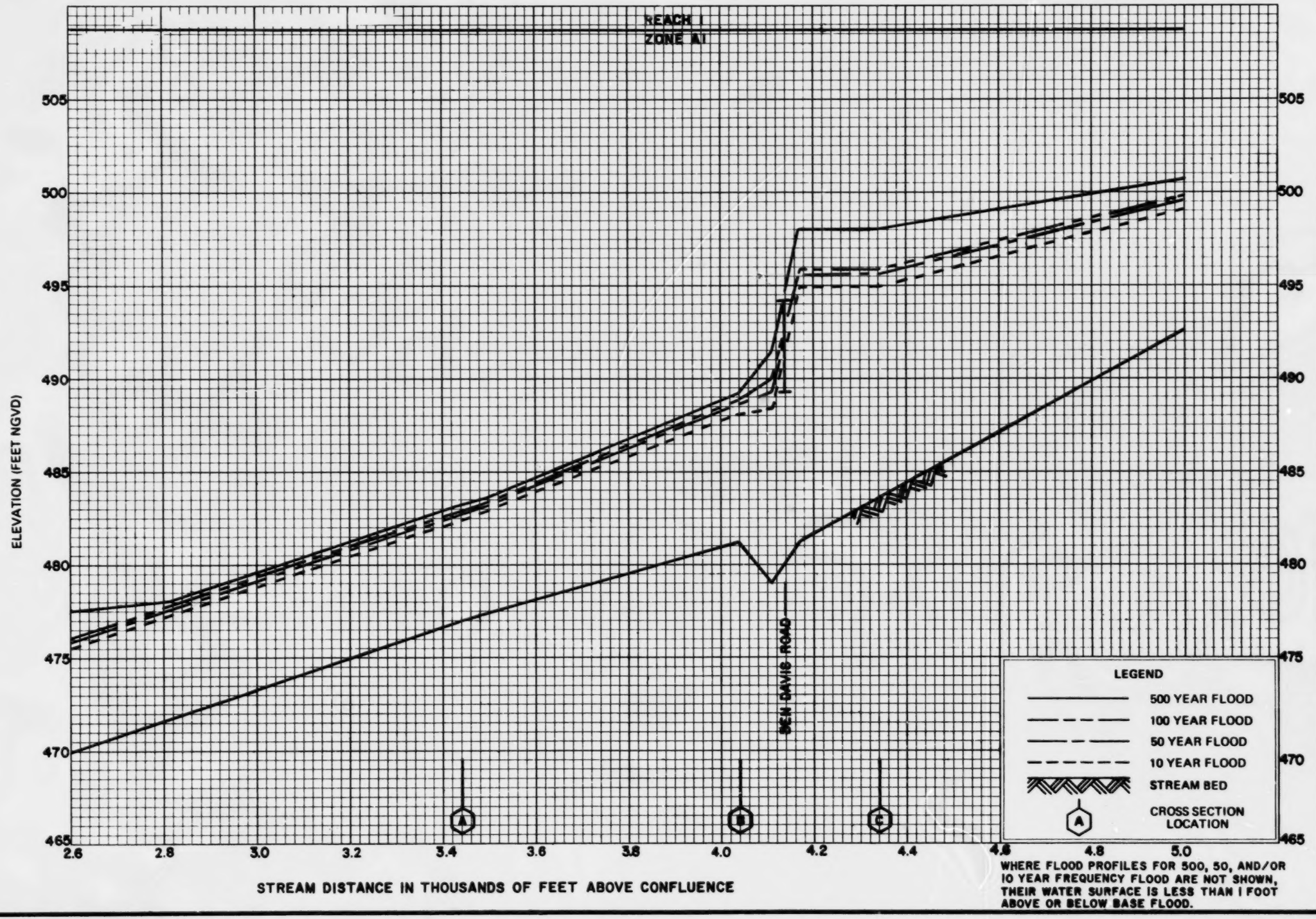

WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

STREAM 2D14

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

33P

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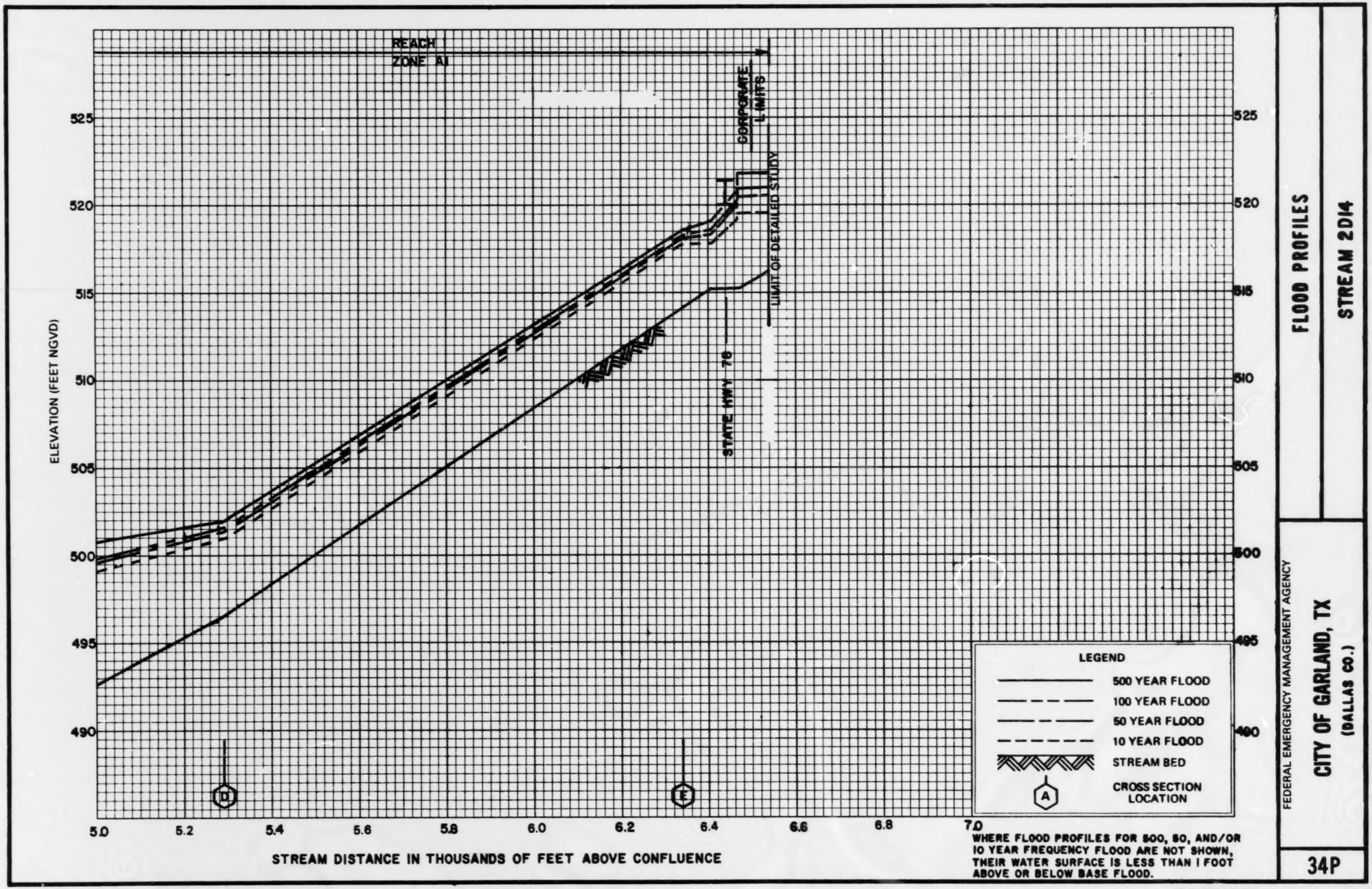

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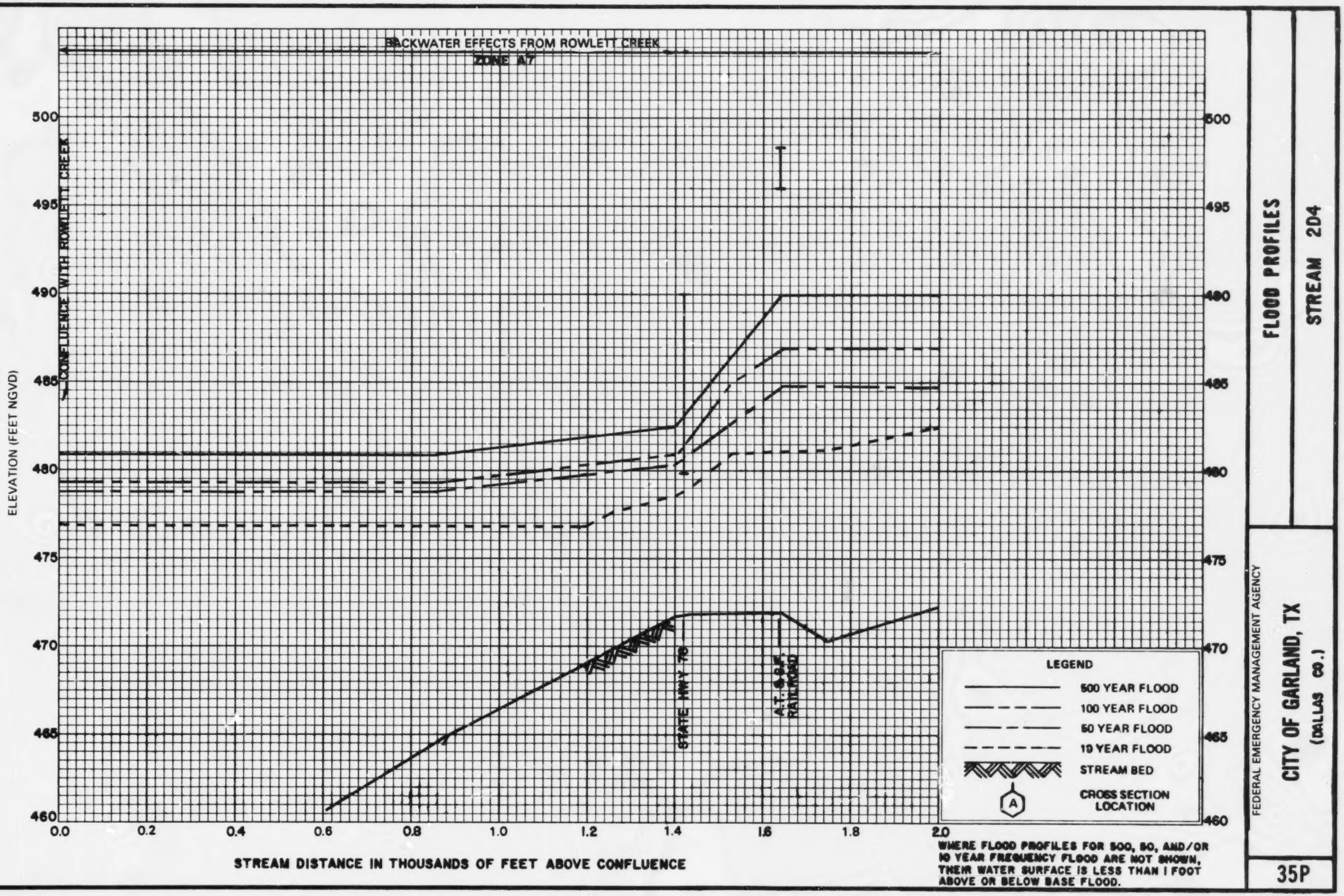

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FLOOD PROFILES

STREAM 2D4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

35P

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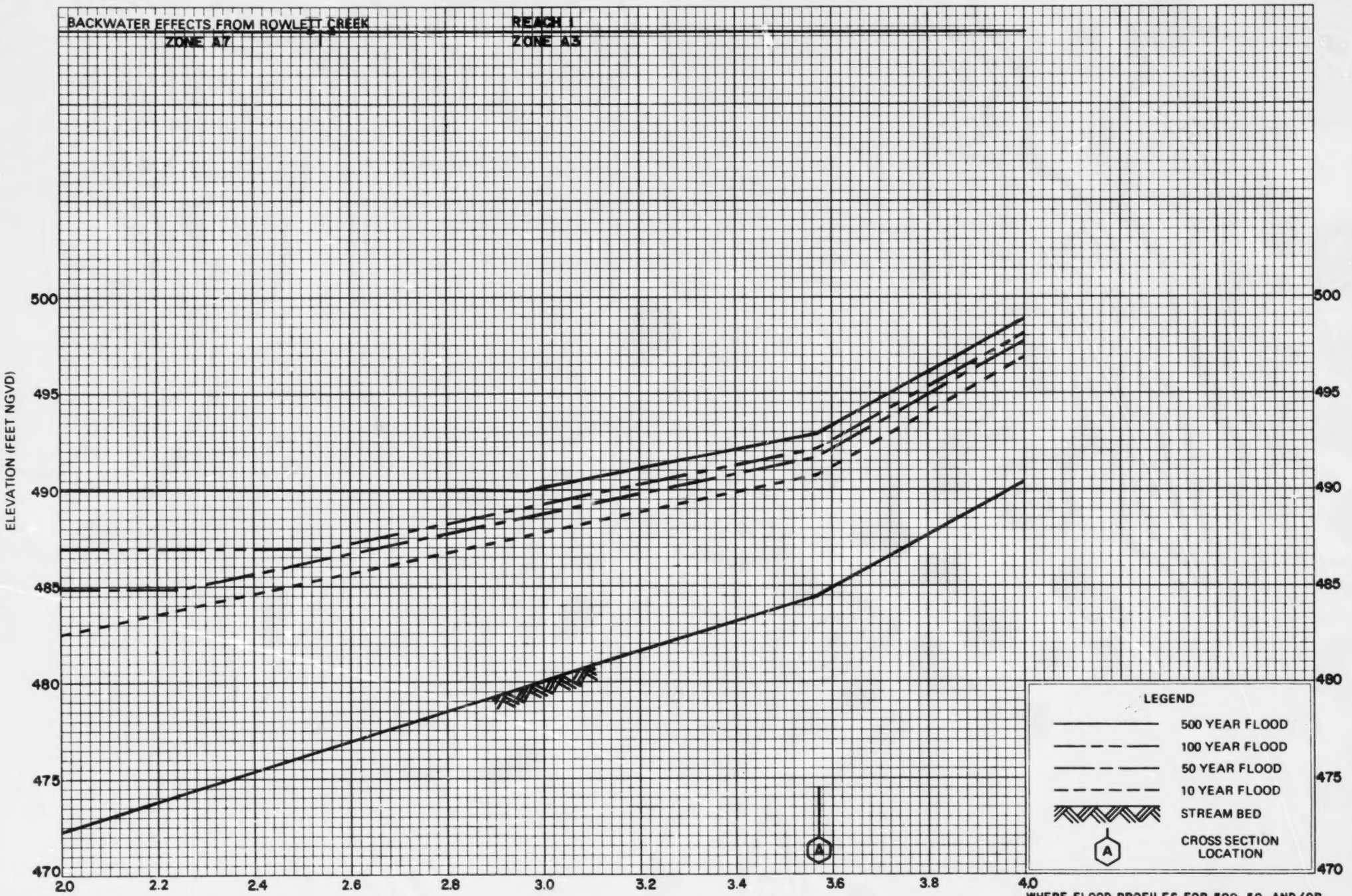
BACKWATER EFFECTS FROM ROWLETT CREEK

ZONE A7 | REACH 1 | ZONE A3



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FLOOD PROFILES

STREAM 2D4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX

(DALLAS CO.)

36P

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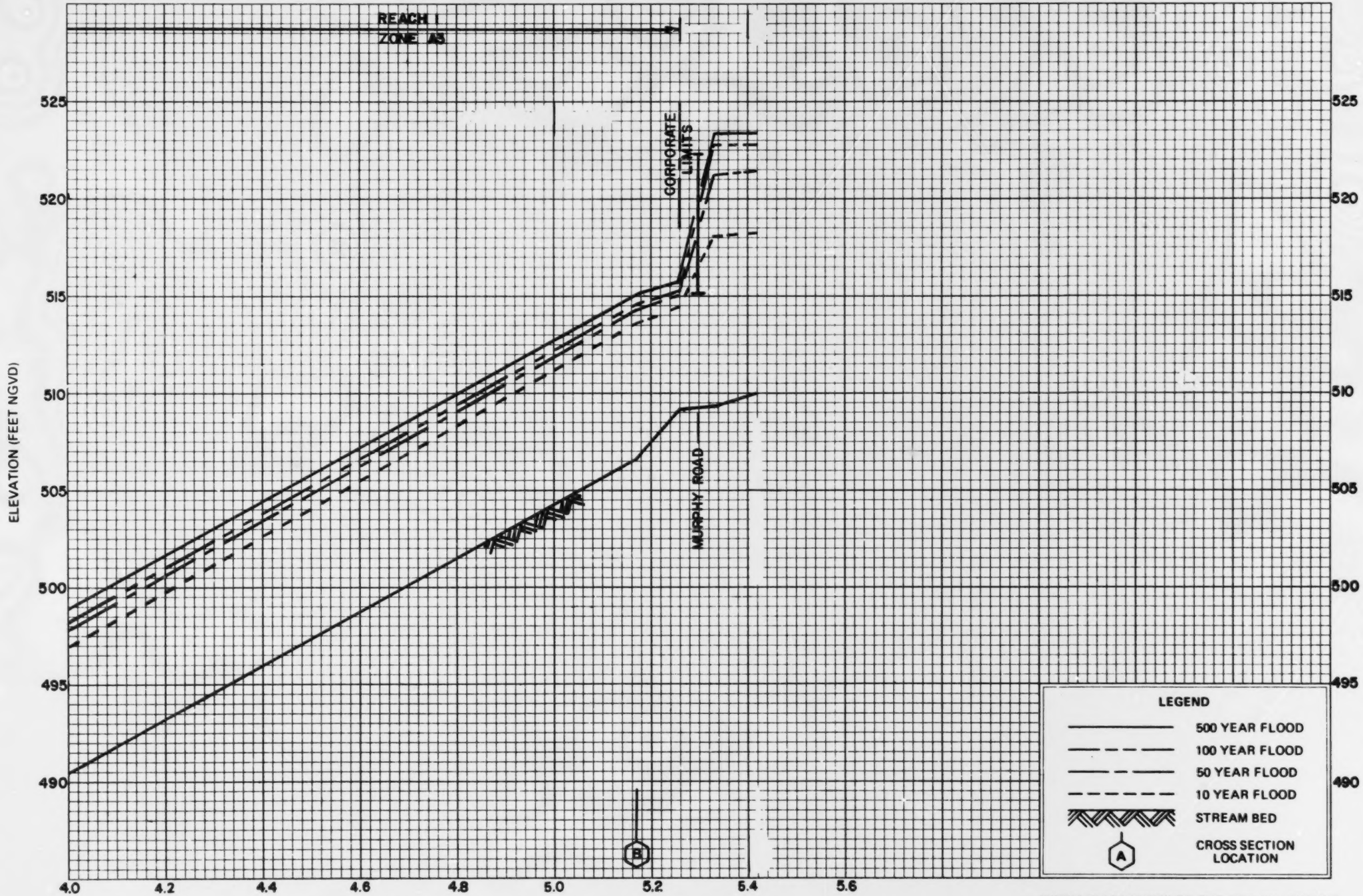

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FLOOD PROFILES

STREAM 2D4

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX

(DALLAS CO.)

37P

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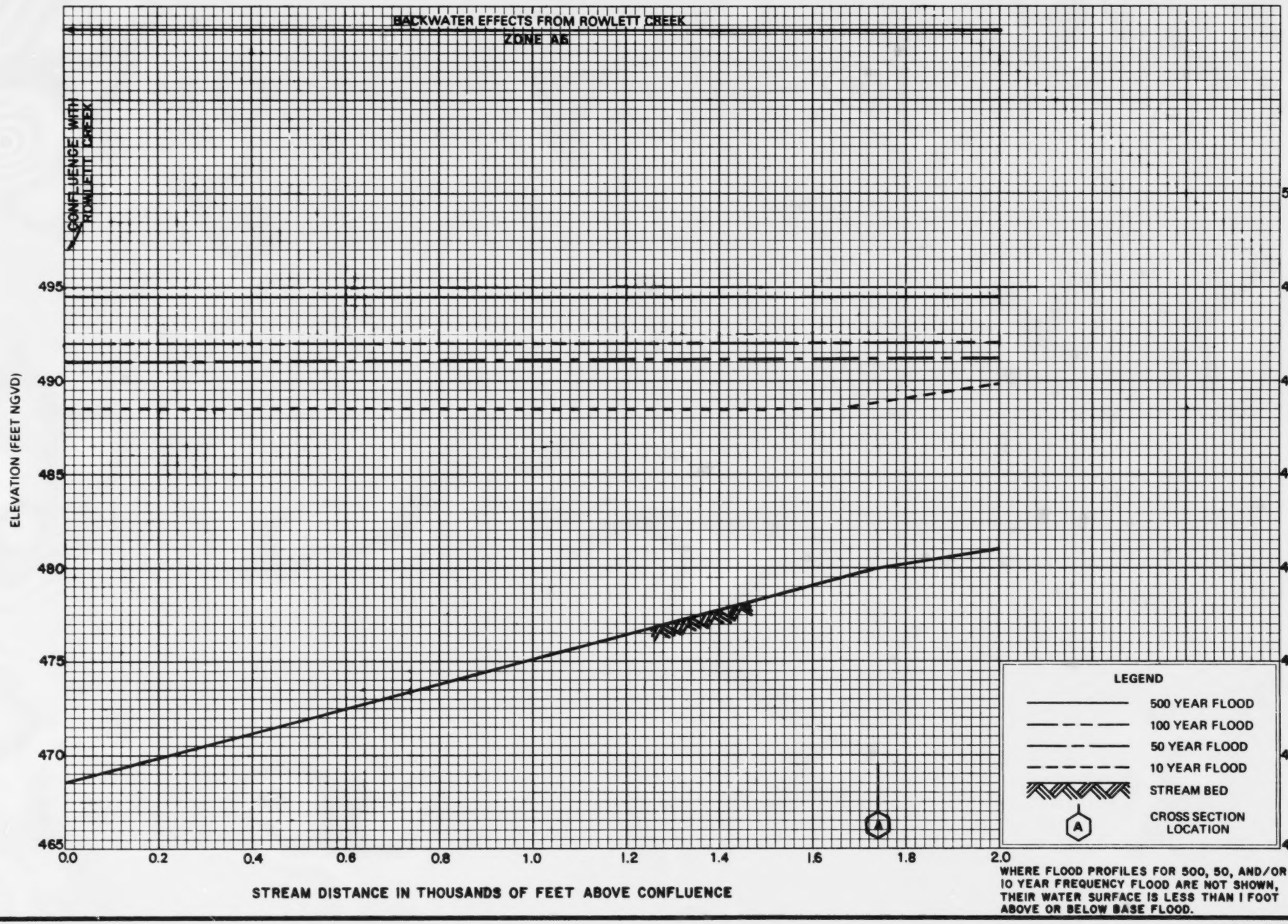

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FLOOD PROFILES

STREAM 205

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

38P

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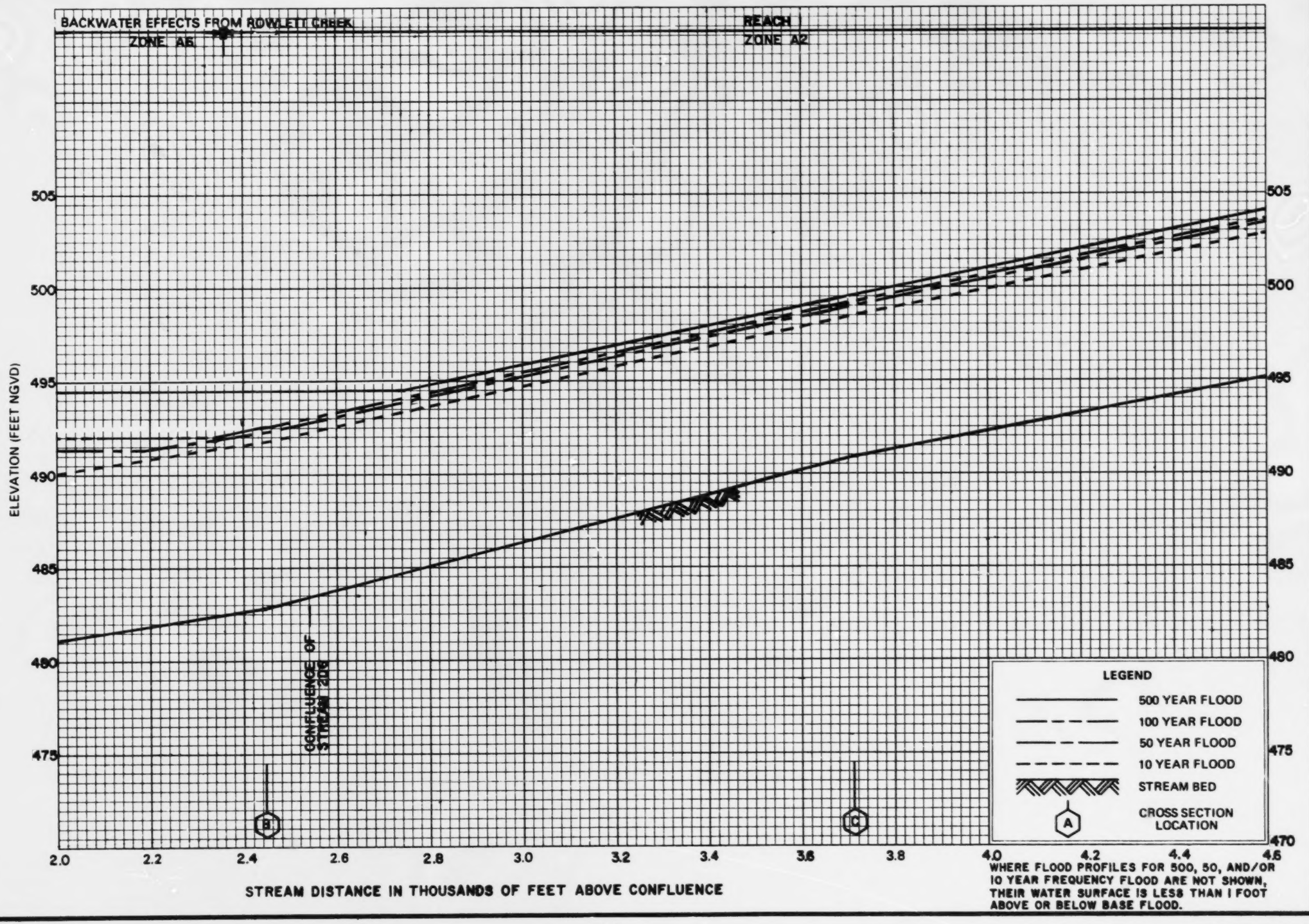

FLOOD PROFILES

STREAM 2D5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

39P

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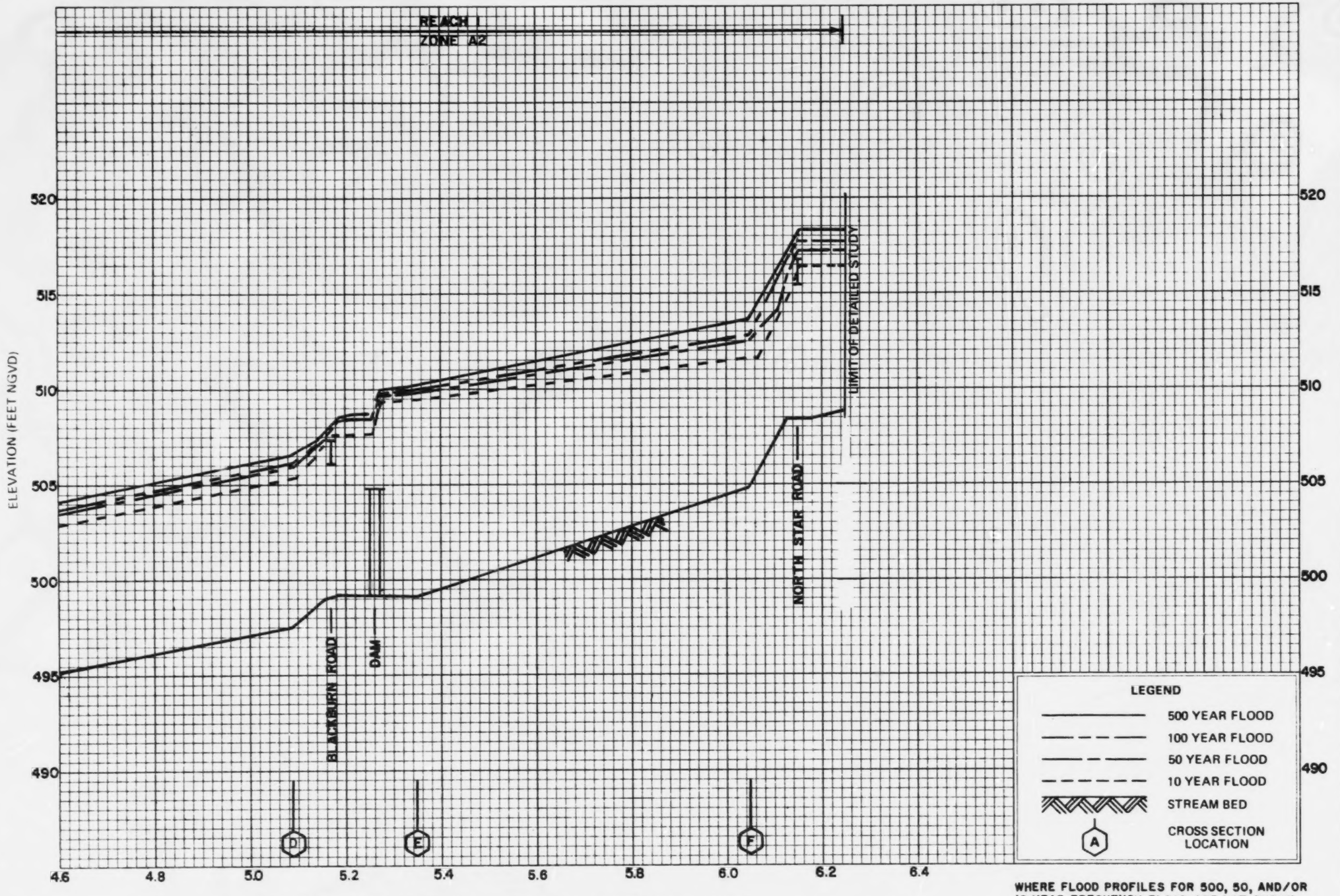

FLOOD PROFILES

STREAM 2D5

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

40P

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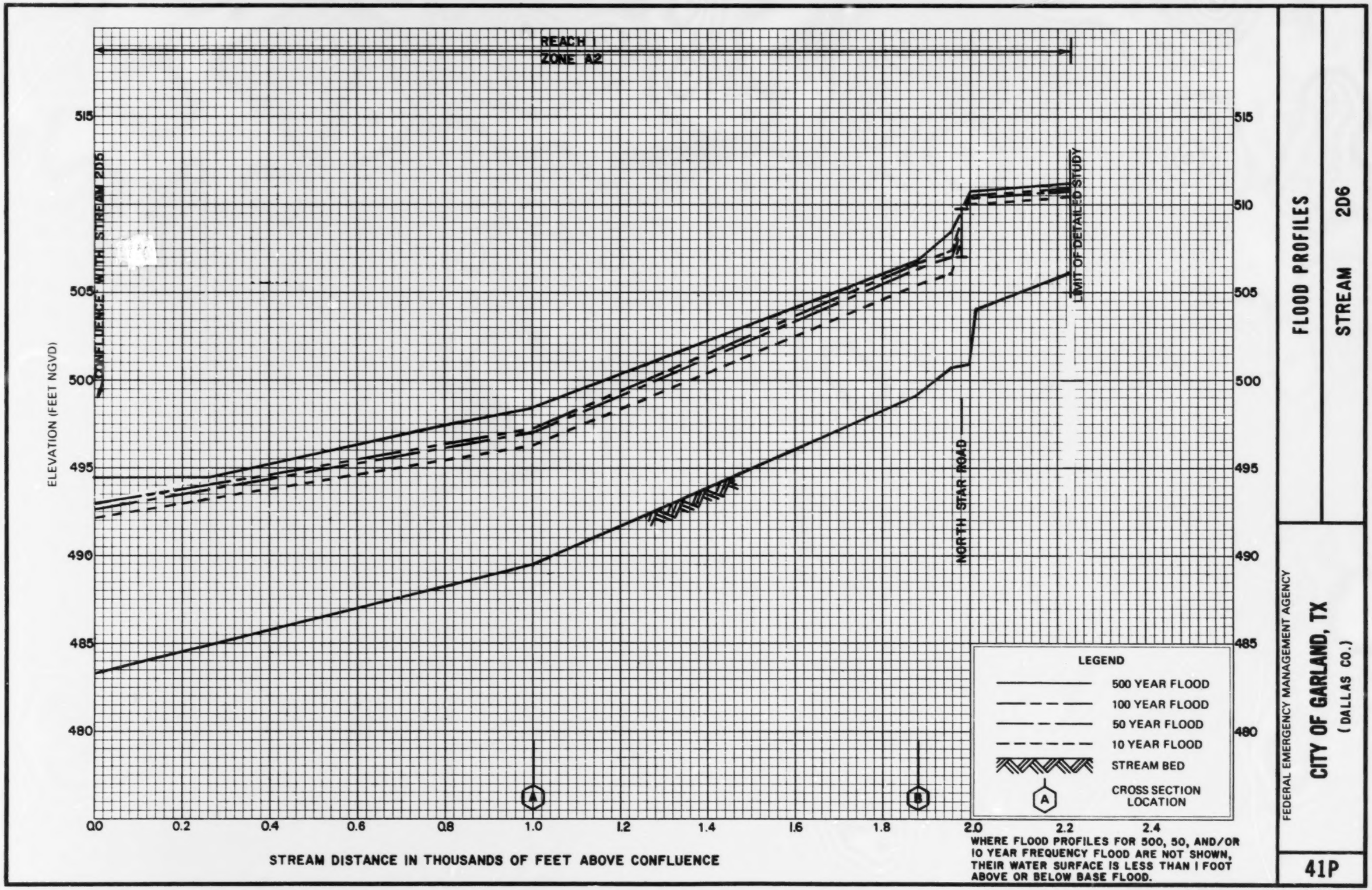

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FLOOD PROFILES

STREAM 2D6

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX

(DALLAS CO.)

41P

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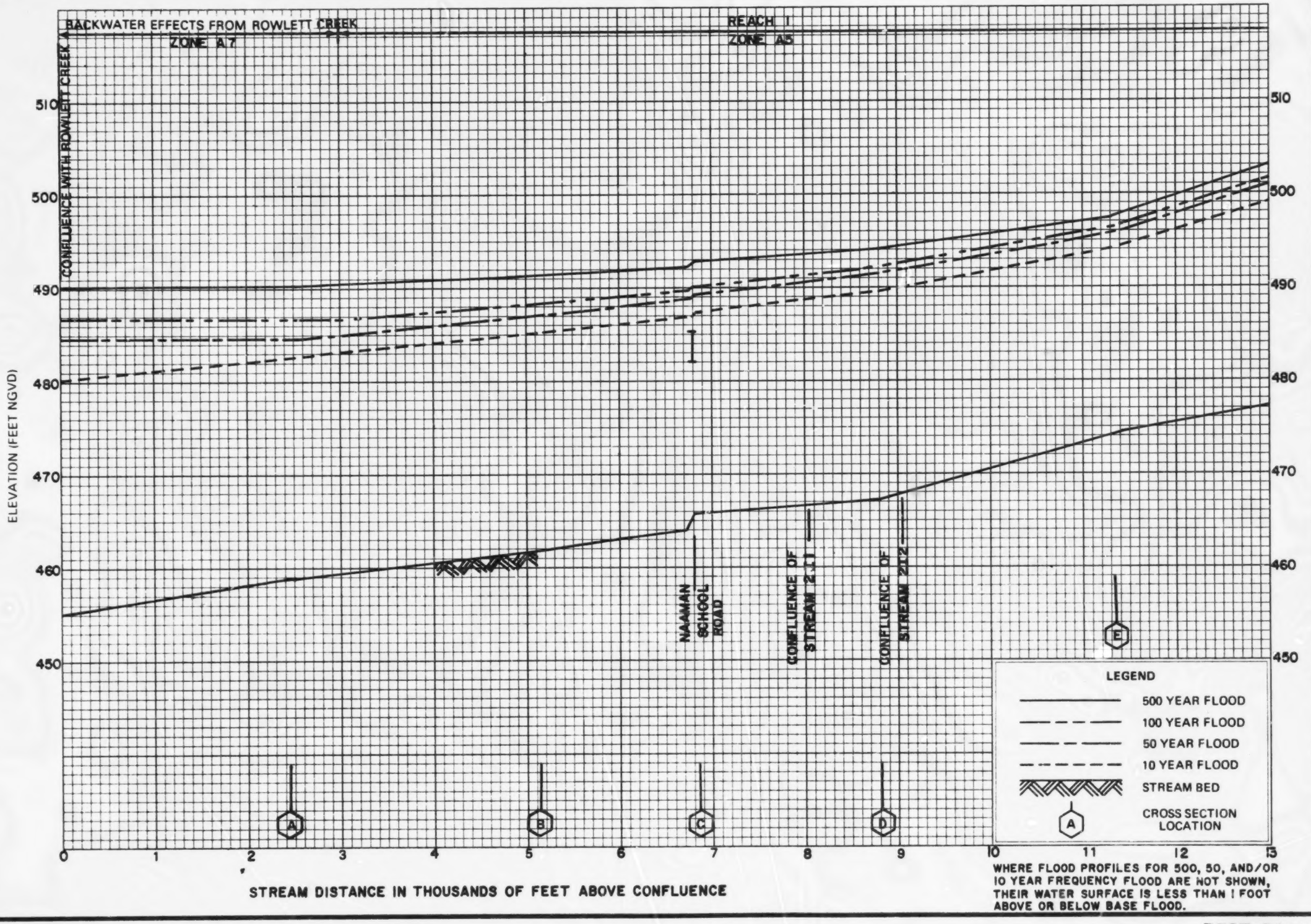

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FLOOD PROFILES

SPRING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

42P

BEST COPY AVAILABLE

REACH I
ZONE AO

ELEVATION (FEET NGVD)

530
520
510
500
490
480
470

CONFLUENCE OF STREAM 2.5
NORTH STAR ROAD
CONFLUENCE OF STREAM 2.4
HOLFORD ROAD
CONFLUENCE OF STREAM 2.3

F
G
H
I
J

13 14 15 16 17 18 19 20 21 22 23 24 25 26

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE

LEGEND
- 500 YEAR FLOOD
- 100 YEAR FLOOD
- 50 YEAR FLOOD
- 10 YEAR FLOOD
- STREAM BED
- A — CROSS SECTION LOCATION

WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

SPRING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

43P

BEST COPY AVAILABLE

REACH I
ZONE A5

CORPORATE LIMITS

ELEVATION (FEET NGVD)

560
550
540
530
520
510
500

CONFLUENCE OF STREAM 2.17

CONFLUENCE OF STREAM 2.17

JUPITER ROAD

CHANNEL DAM

BIG SPRING ROAD

O
P
K
L
M
N

LEGEND

500 YEAR FLOOD
100 YEAR FLOOD
50 YEAR FLOOD
10 YEAR FLOOD
STREAM BED
CROSS SECTION LOCATION
A

26 27 28 29 30 31 32 33 34 35 36 37 38 39

STREAM DISTANCE IN THOUSANDS OF FEET ABOVE CONFLUENCE

WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

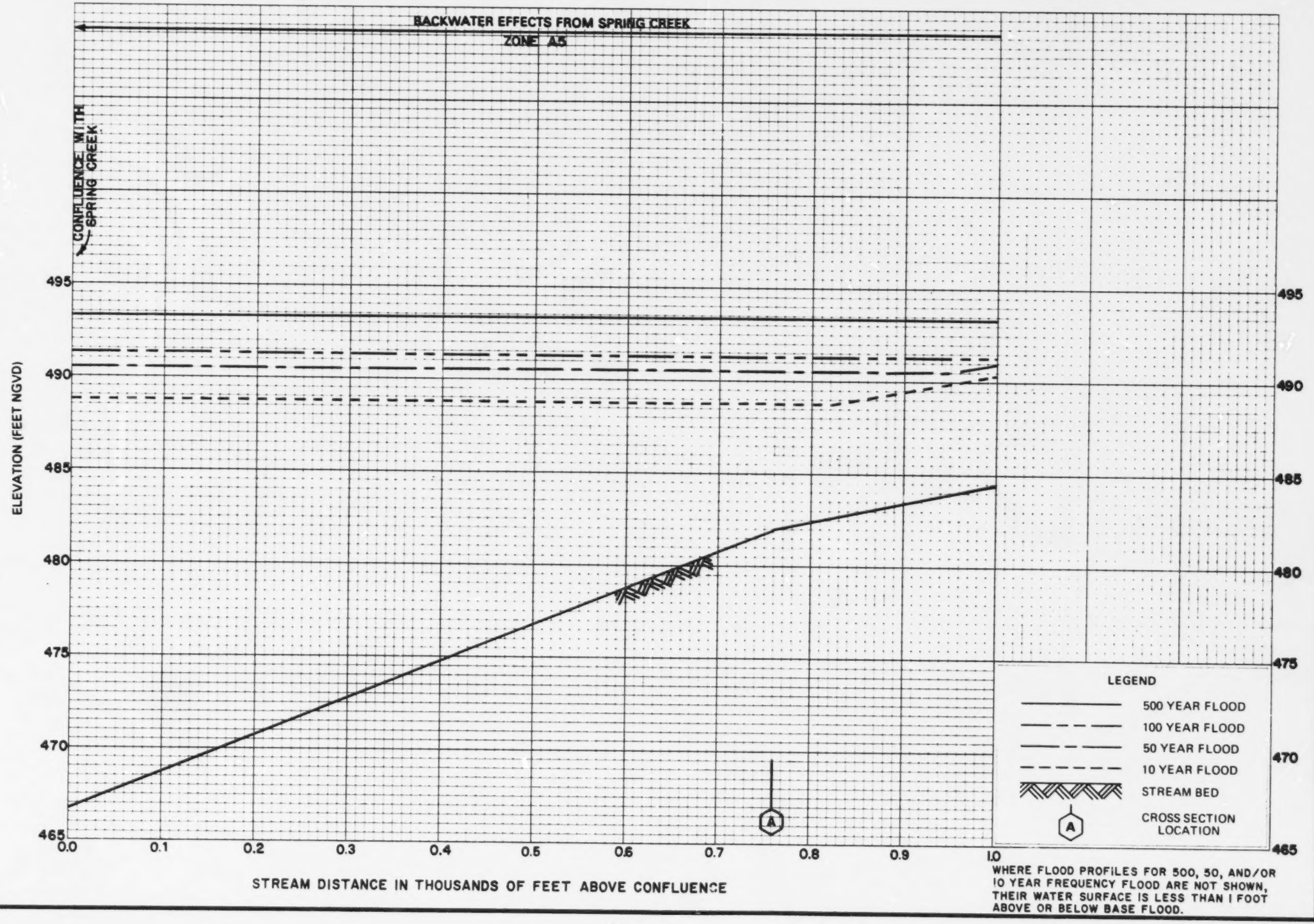
SPRING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

44P

BEST COPY AVAILABLE



WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

STREAM 2I1

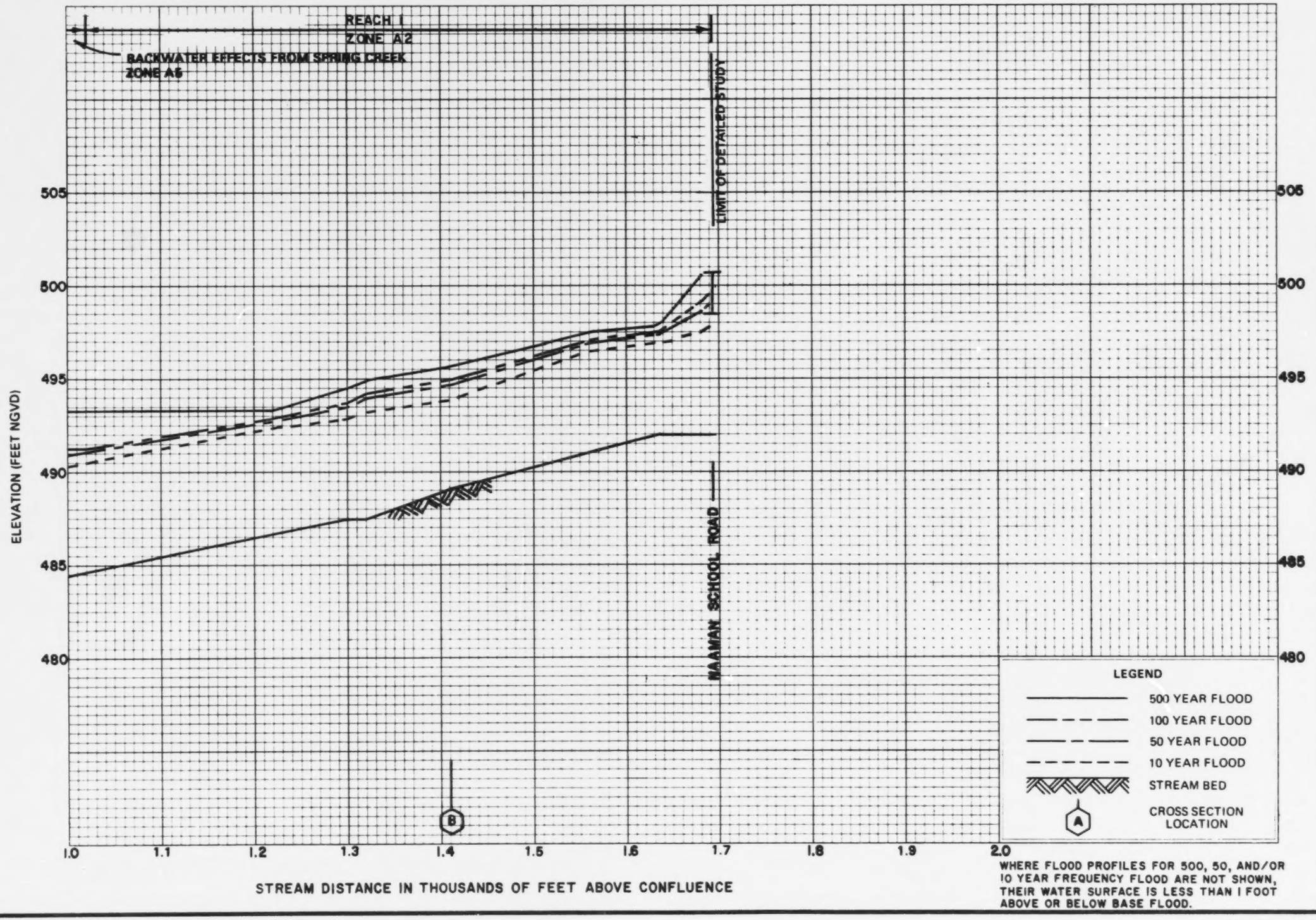
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX

(DALLAS CO.)

45P

BEST COPY AVAILABLE



WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

STREAM 2I

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX

(DALLAS CO.)

46P

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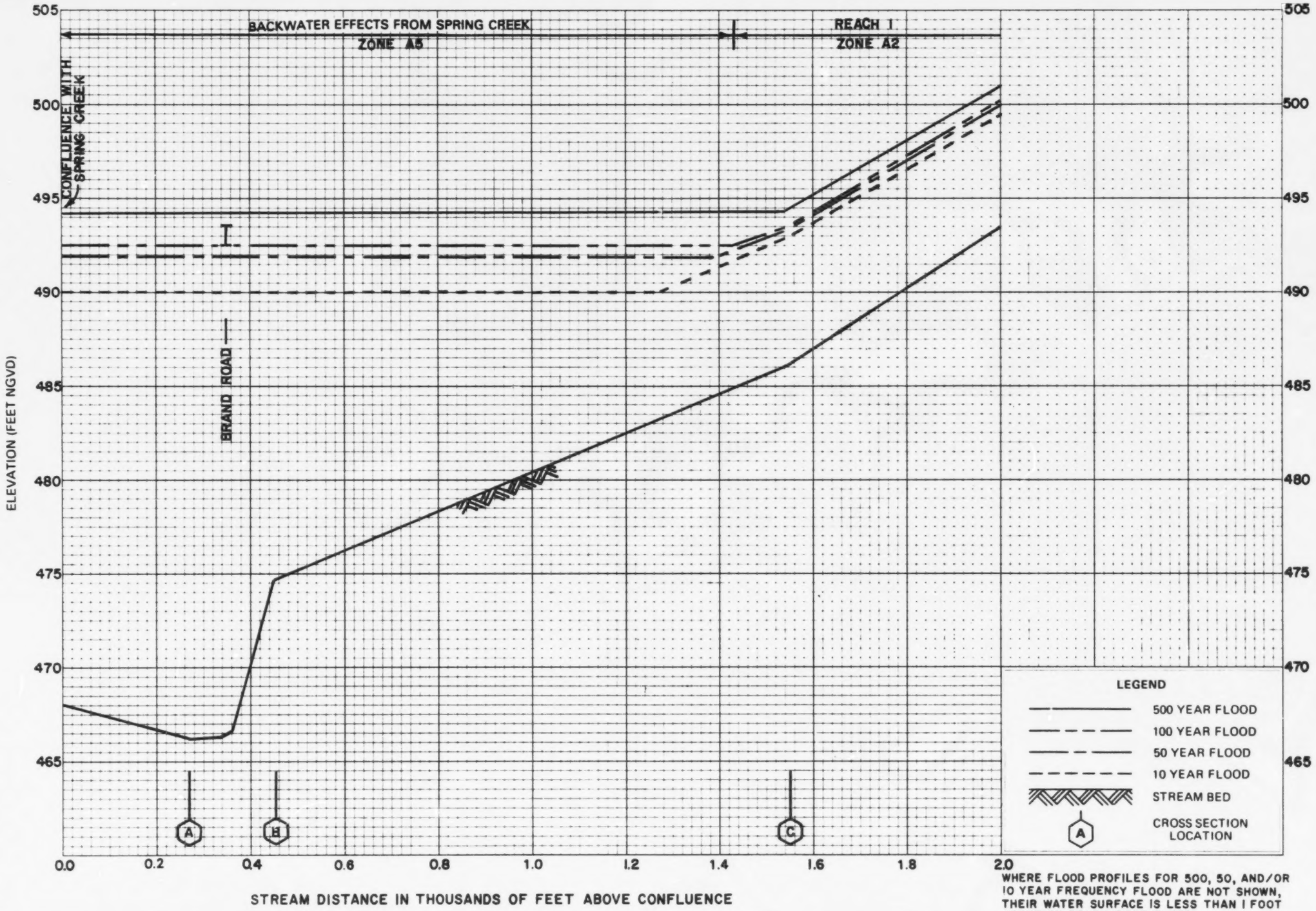


FLOOD PROFILES

STREAM 212

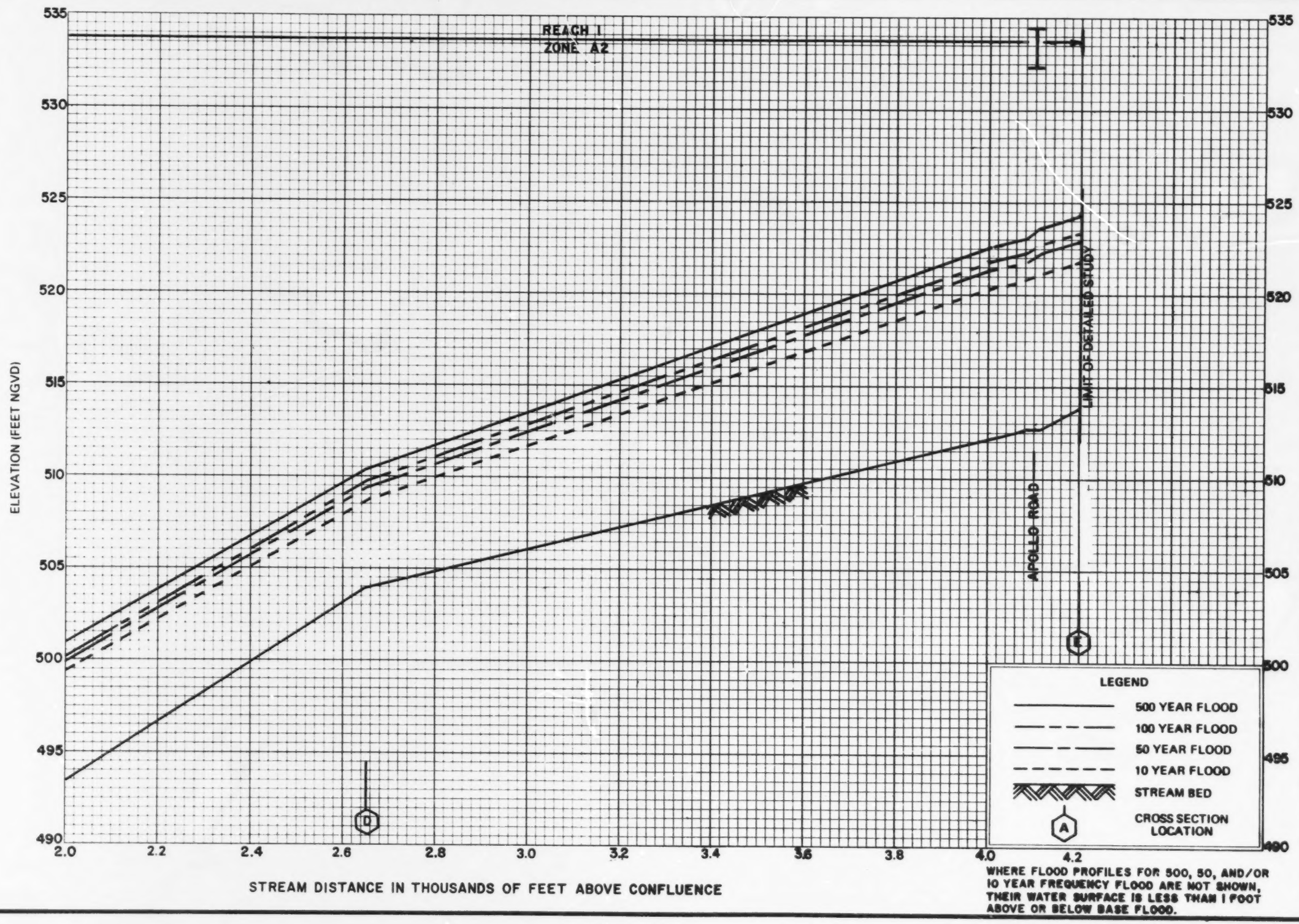
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX

(DALLAS CO.)

47P

BEST COPY AVAILABLE



WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

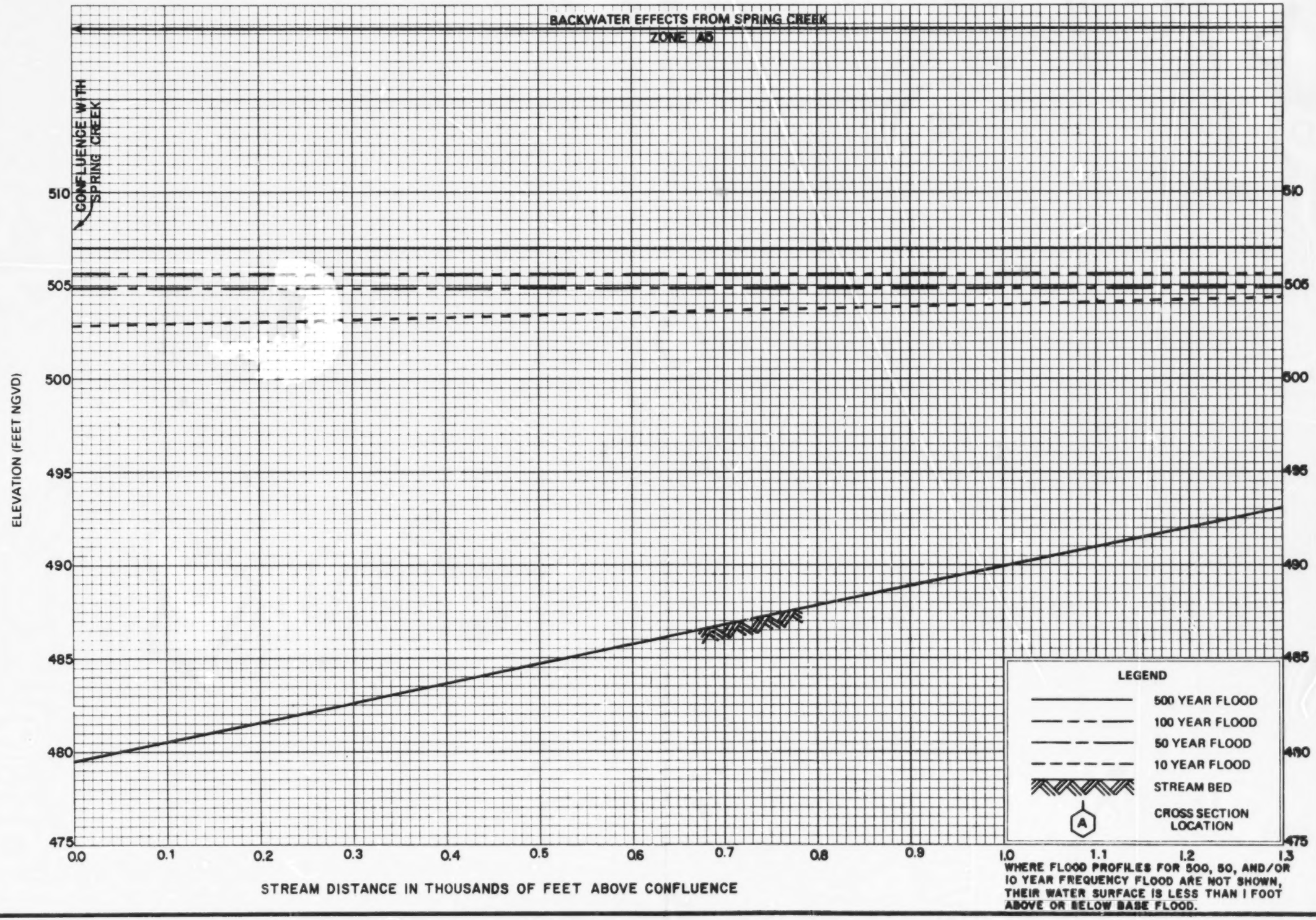
STREAM 212

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

48P

BEST COPY AVAILABLE



FLOOD PROFILES

STREAM 213

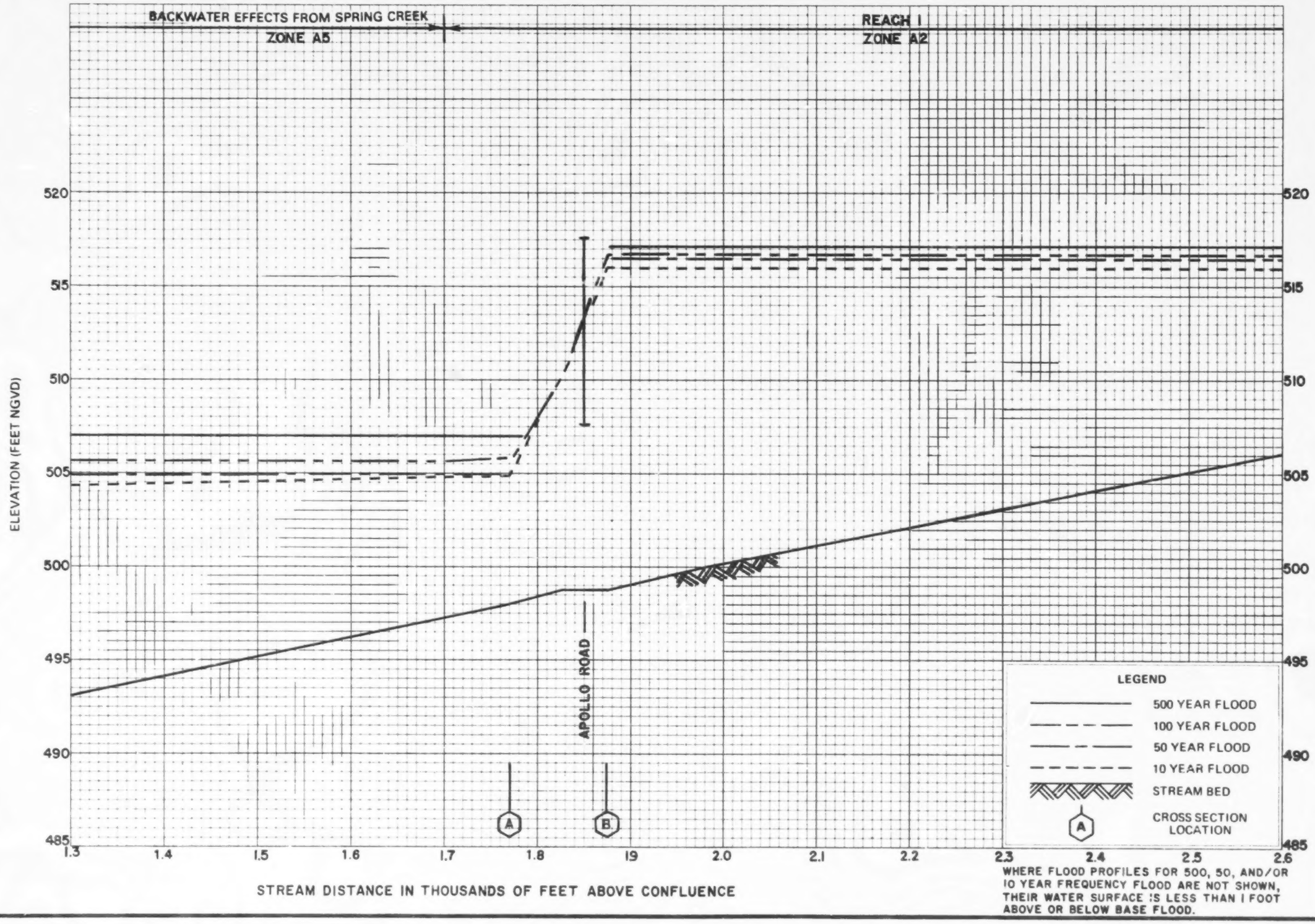
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX

(DALLAS CO.)

49P

BEST COPY AVAILABLE



FLOOD PROFILES

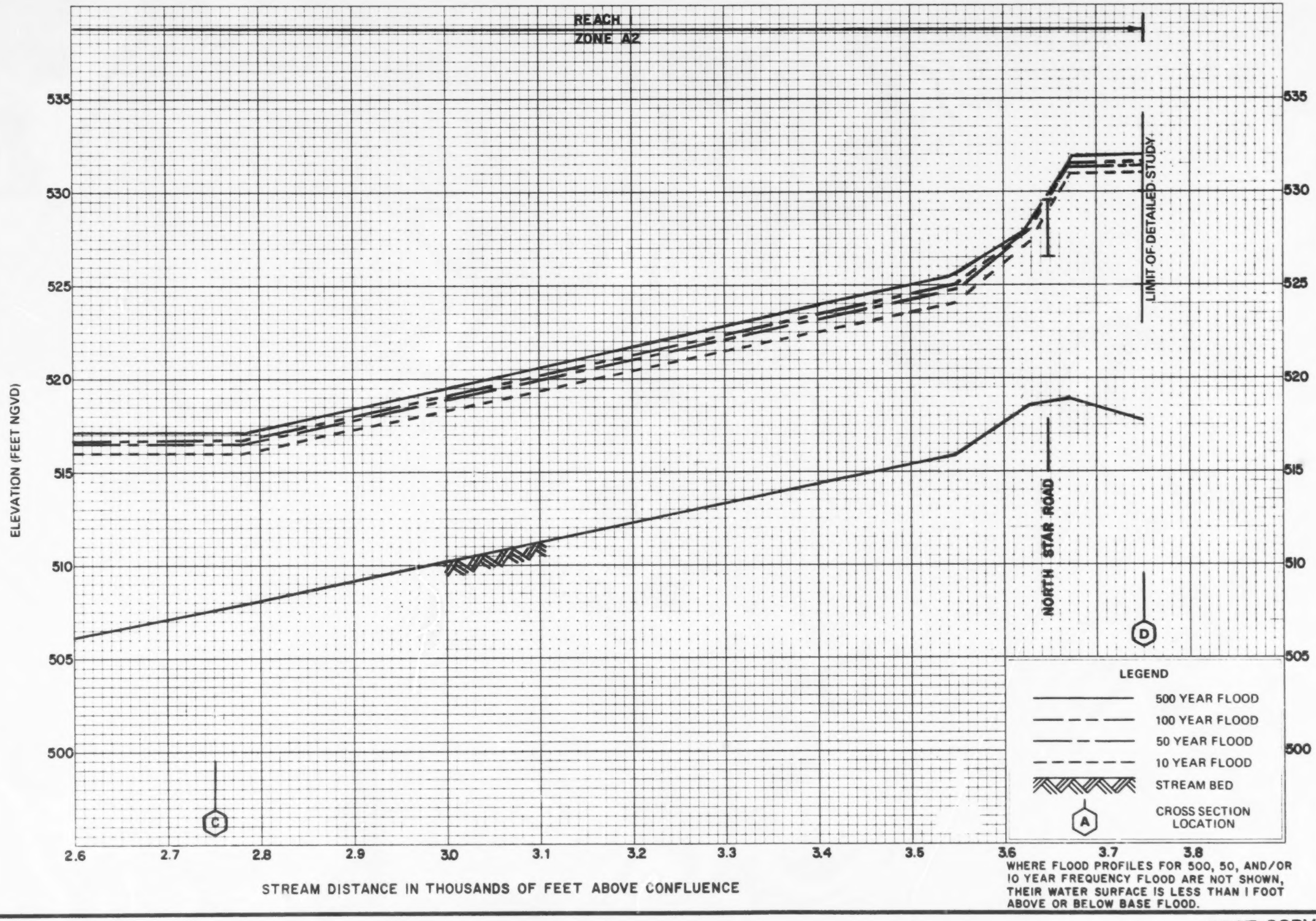
STREAM 213

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

50P

BEST COPY AVAILABLE



WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

STREAM 213

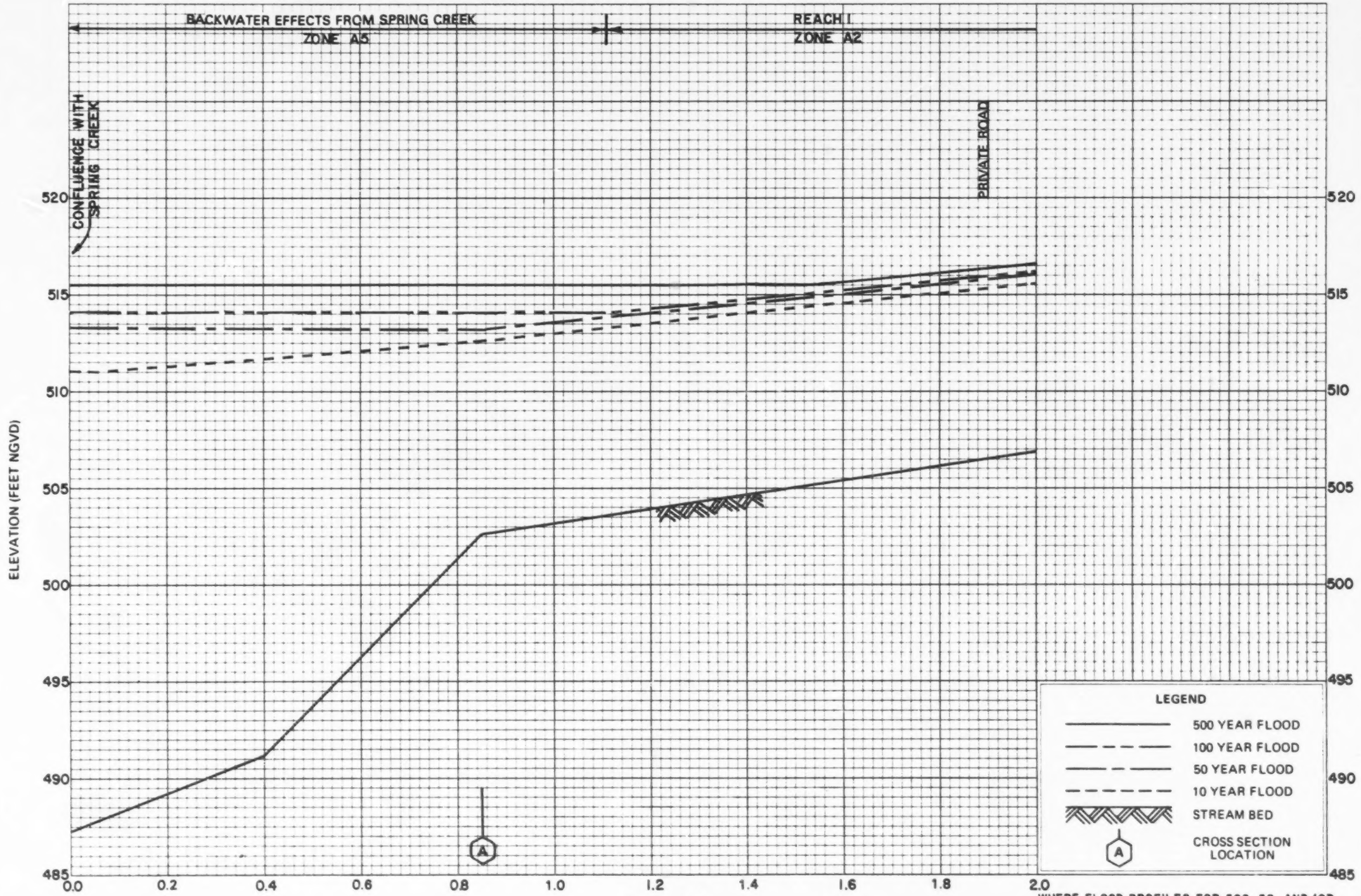
FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX

(DALLAS CO.)

51P

BEST COPY AVAILABLE



FLOOD PROFILES

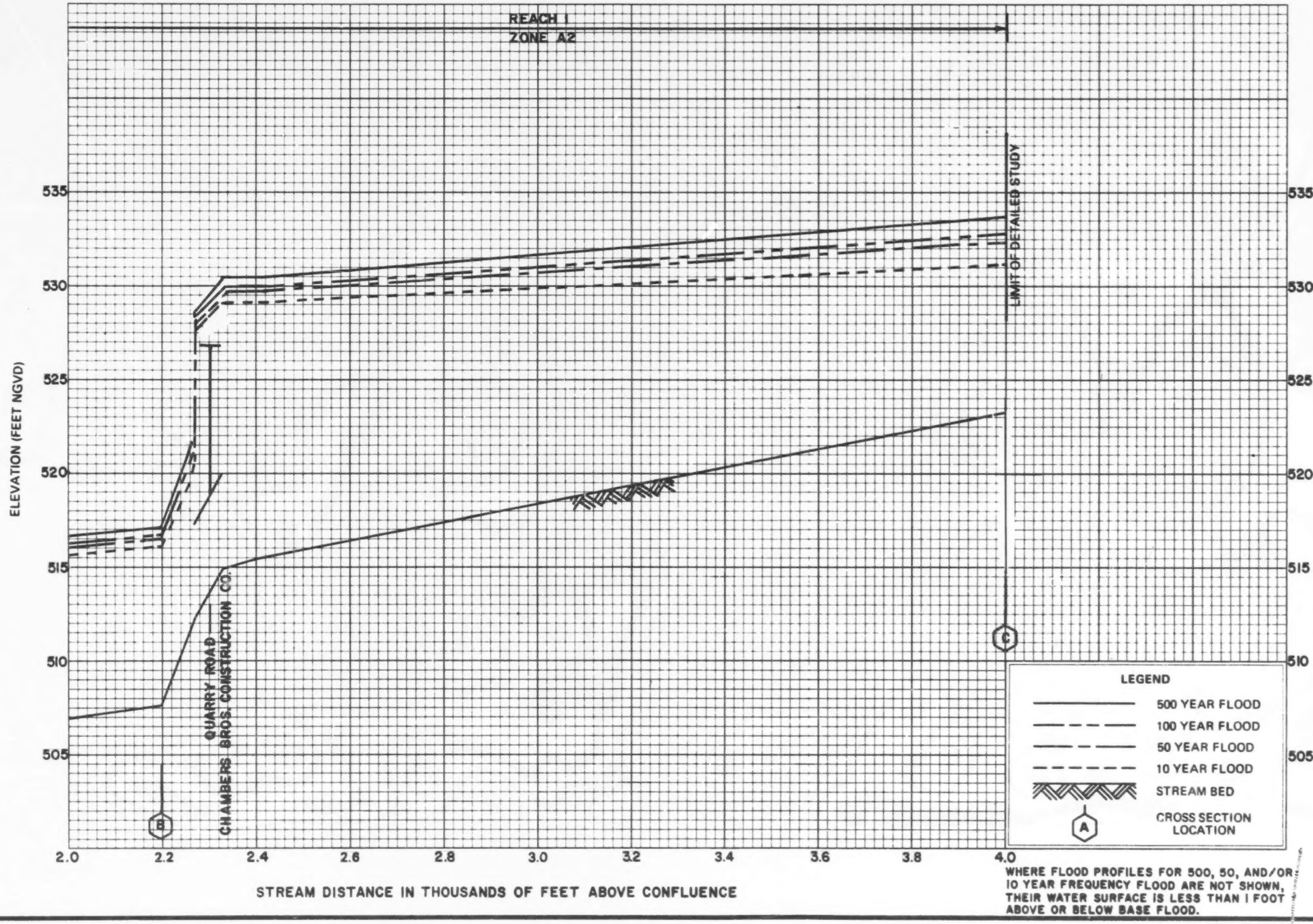
STREAM 214

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

52P

BEST COPY AVAILABLE



WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

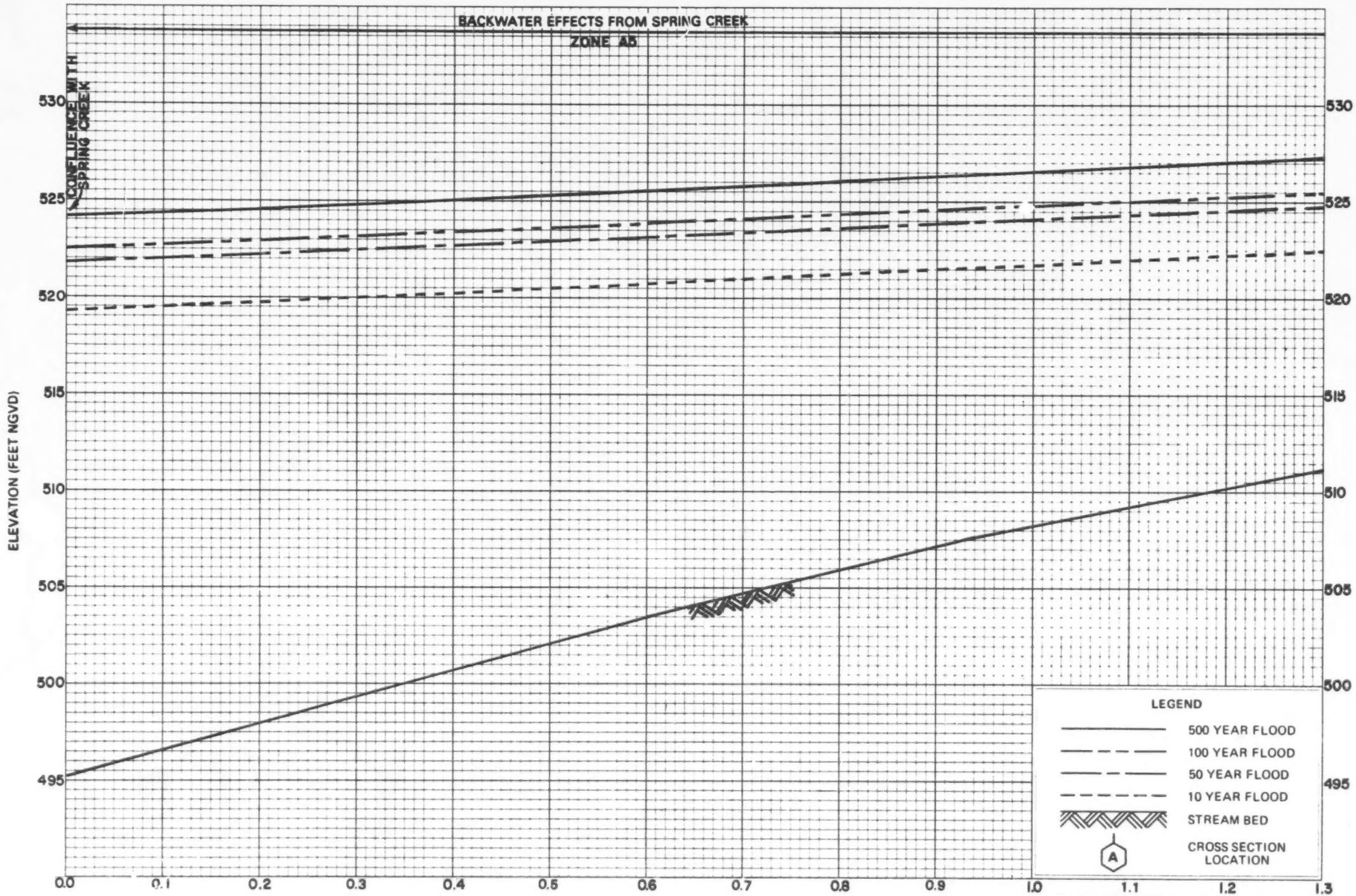
STREAM 274

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

53P

BEST COPY AVAILABLE



FLOOD PROFILES

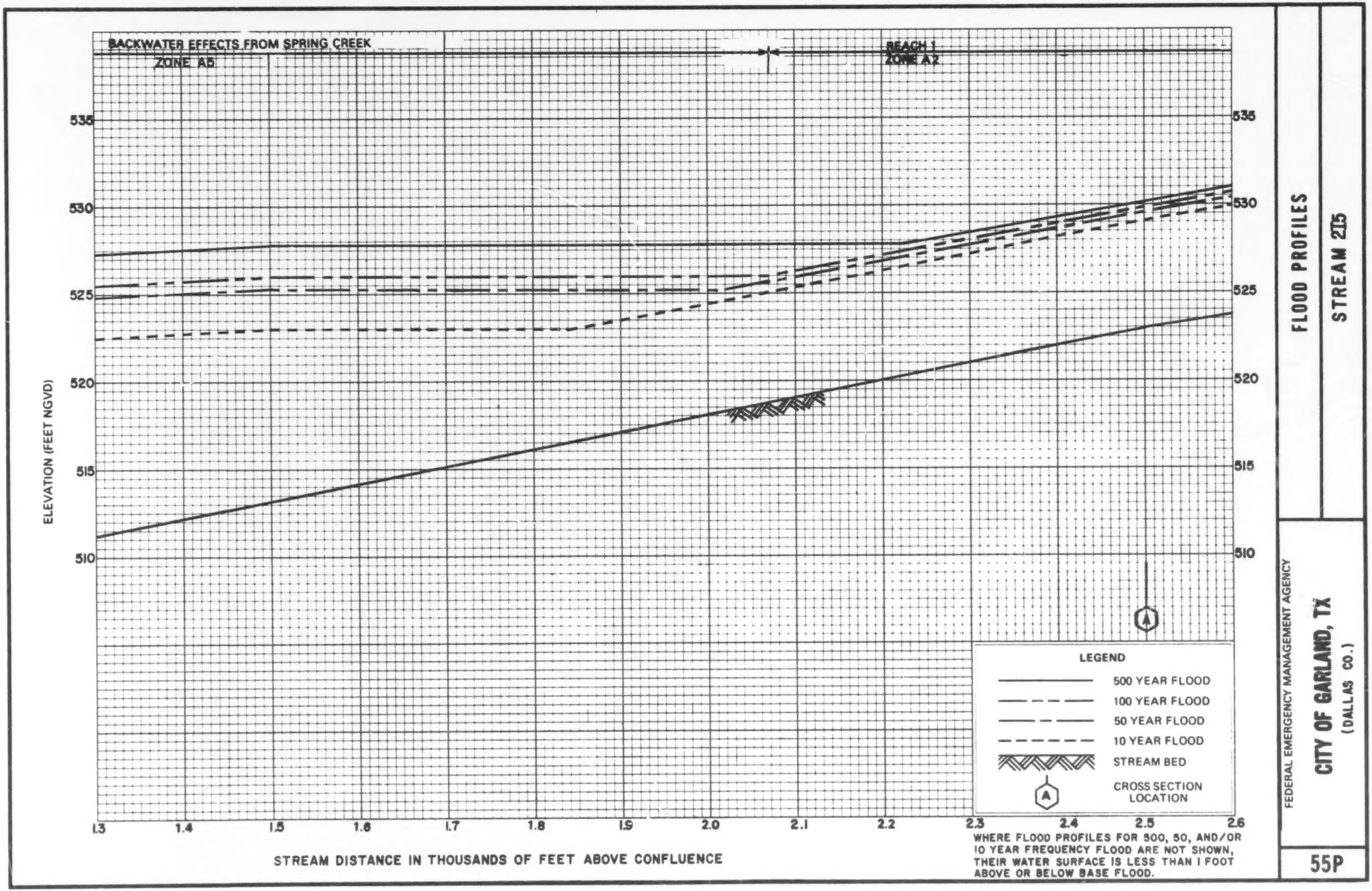
STREAM 215

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

54P

BEST COPY AVAILABLE



WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

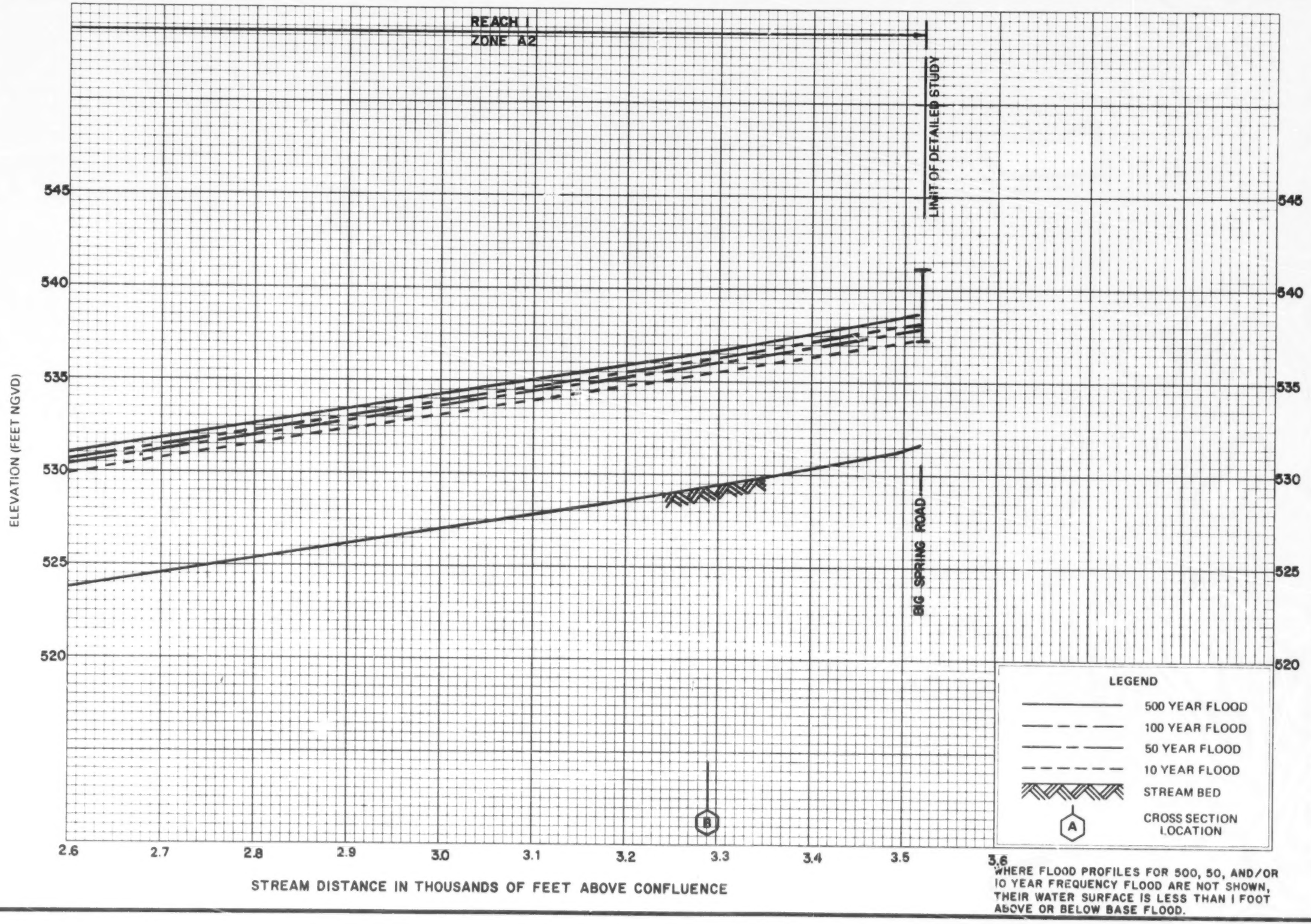
STREAM 215

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

55P

BEST COPY AVAILABLE



WHERE FLOOD PROFILES FOR 500, 50, AND/OR 10 YEAR FREQUENCY FLOOD ARE NOT SHOWN, THEIR WATER SURFACE IS LESS THAN 1 FOOT ABOVE OR BELOW BASE FLOOD.

FLOOD PROFILES

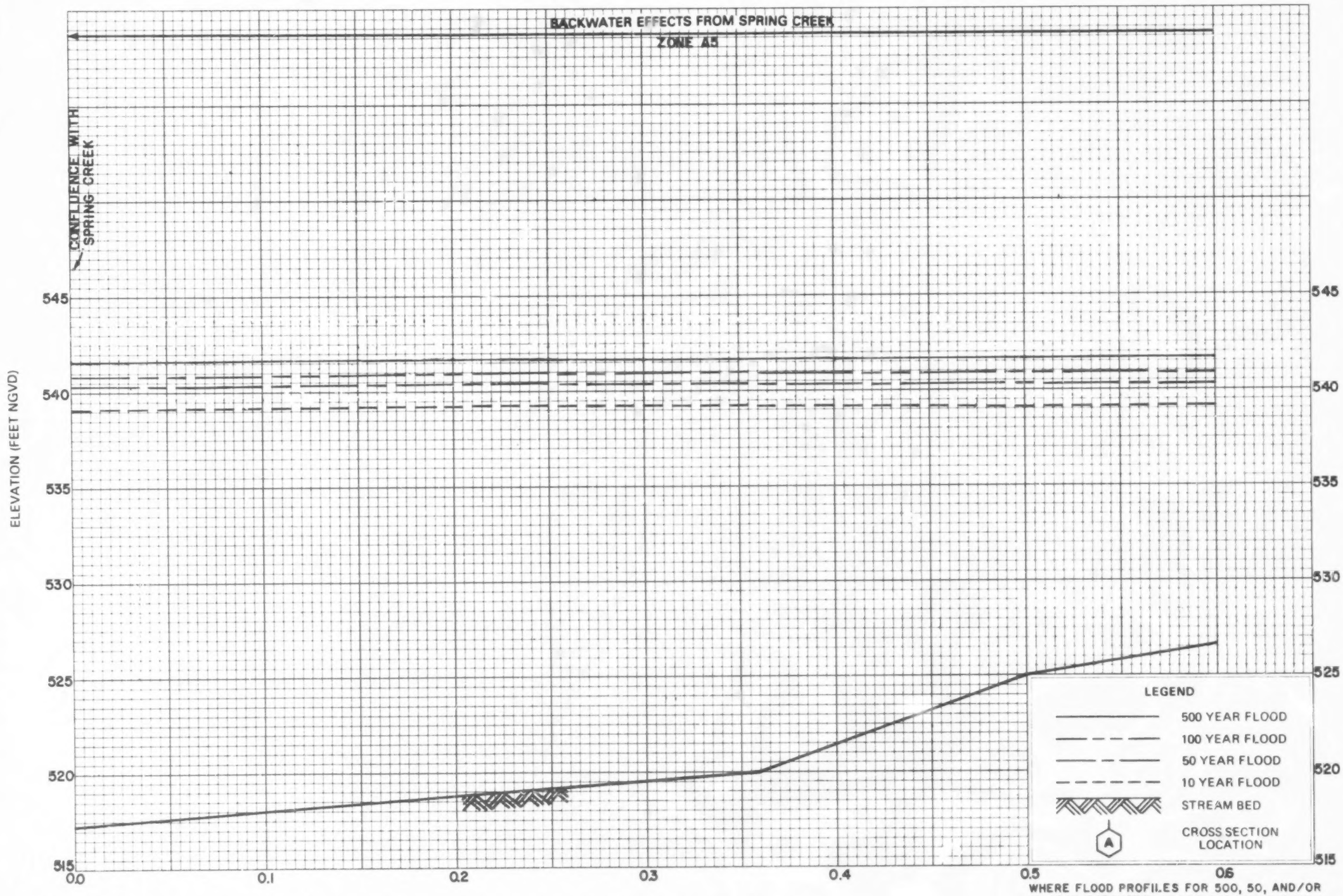
STREAM 215

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

56P

BEST COPY AVAILABLE



FLOOD PROFILES

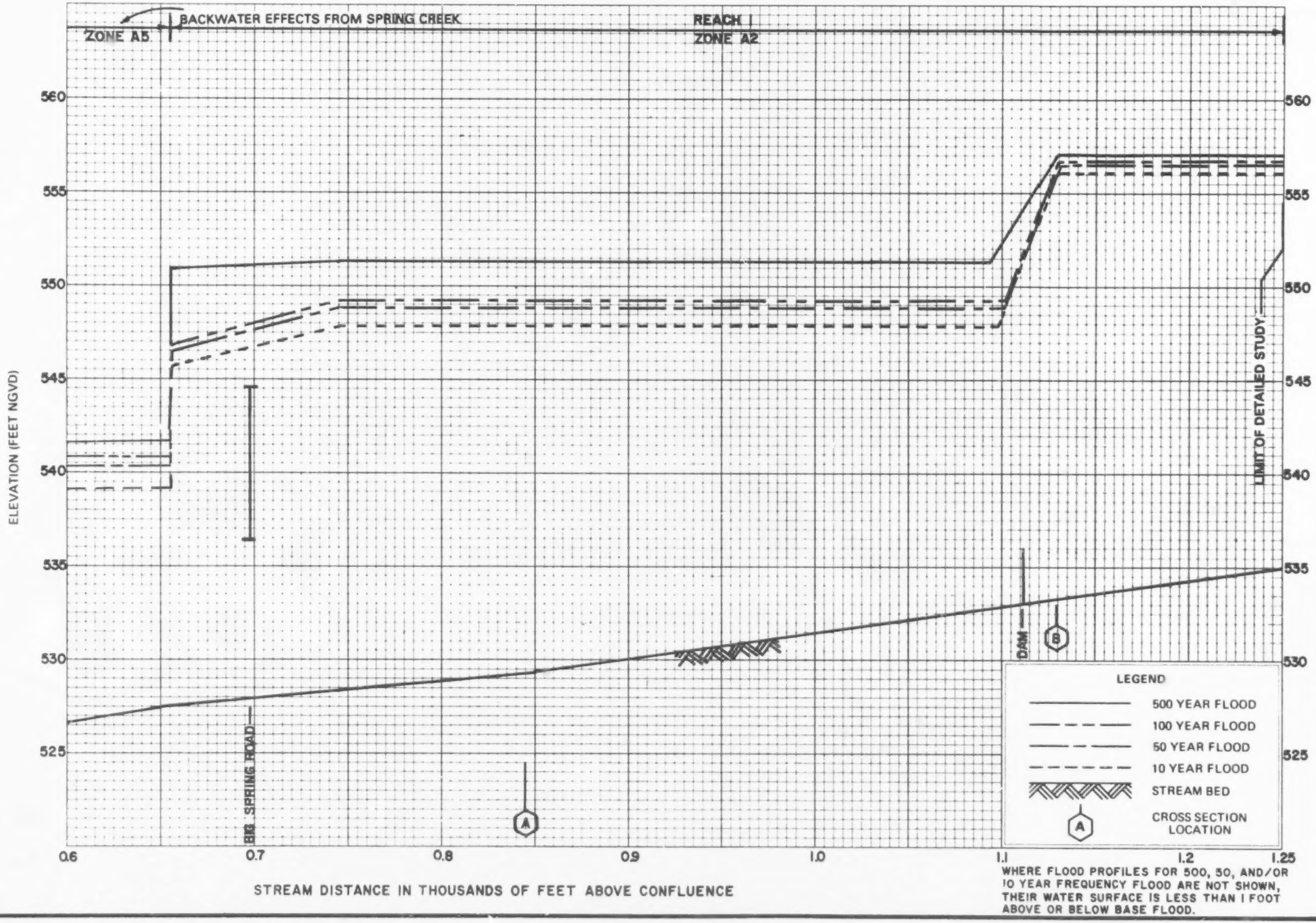
STREAM 216

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

57P

BEST COPY AVAILABLE



FLOOD PROFILES

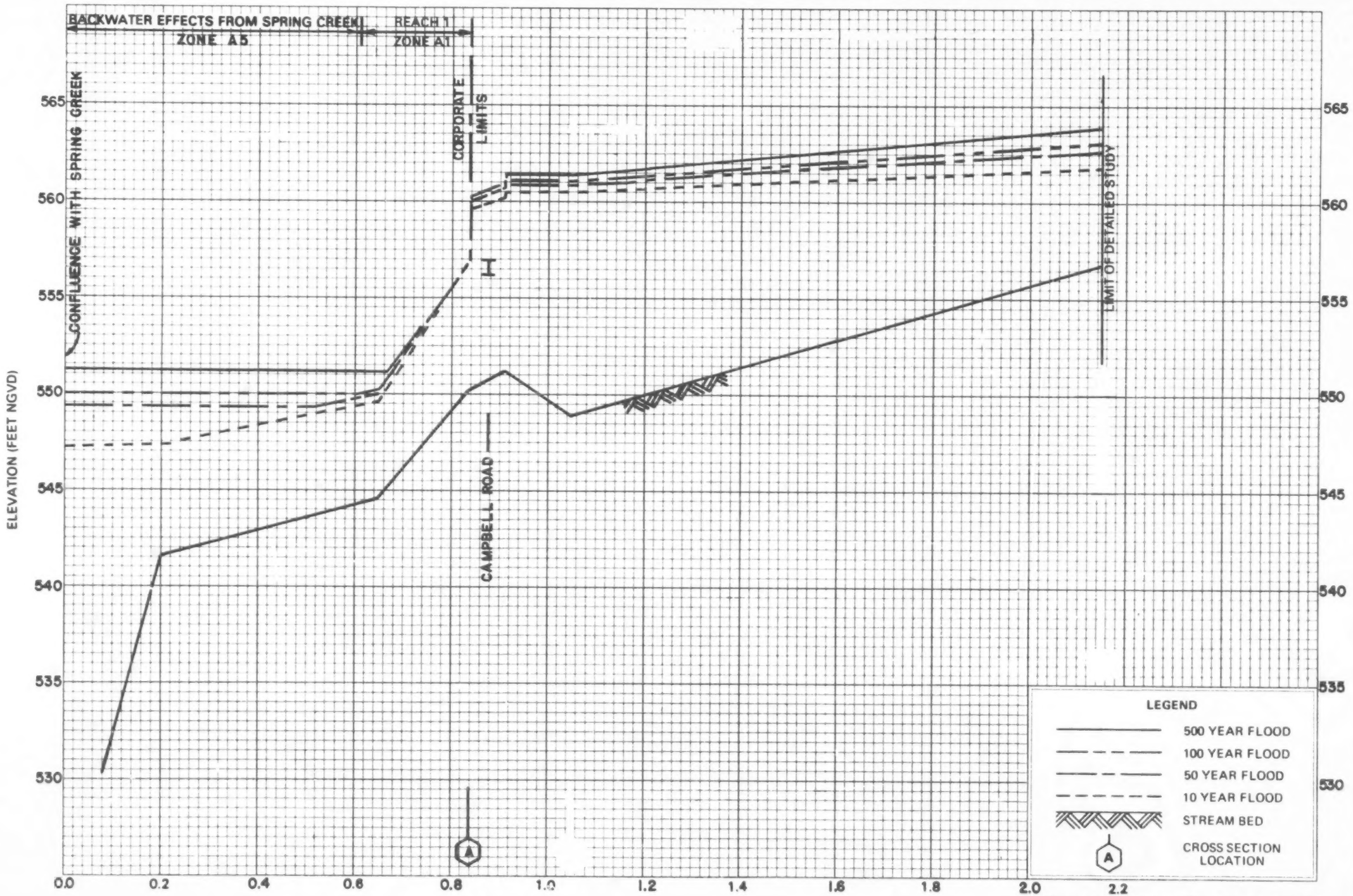
STREAM 216

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

58P

BEST COPY AVAILABLE



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FLOOD PROFILES

STREAM 2I7

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF GARLAND, TX
(DALLAS CO.)

59P

BEST COPY AVAILABLE